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1977 DIRECT ENERGY TRANSACTIONS MATRIX  
AND ESTIMATED ENERGY INTENSITIES

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AND ESTIMATED ENERGY INTENSITIES

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## ABSTRACT

In the pages that follow, an input-output matrix is derived which shows the direct purchase of energy in British Thermal Units by each of 88 industrial consuming sectors and 7 final demand sectors which comprise the U.S. economy for 1977. All consuming sectors are defined using Bureau of Economic Analysis (BEA) conventions. Purchases are shown for the products Coal, Crude Oil and Natural Gas, Refined Petroleum, gas from Gas Utilities, and Electricity. For energy products the Direct Energy Transactions Matrix (DET) corresponds to the Bureau of Economic Analysis Use Matrix. The DET is produced using data from the National Energy Accounts developed by Jack Faucett Associates, Inc., for the Department of Energy.

Also presented in this study are 1977 energy intensities based upon the 1977 DET.



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## 1.0 INTRODUCTION

The purpose of this report is to (1) explain the steps necessary to transform the data compiled in the National Energy Accounts (NEA), 1981 tapes, into a form which is in agreement with the definitions and conventions used by the Bureau of Economic Analysis (BEA) in their input-output studies, and (2) to produce from the National Energy Accounts a Direct Energy Transactions Matrix (DET) for 1977. The resulting matrix shows direct sales of five basic energy products to 88 consuming sectors (five of which are the energy sectors themselves) as well as to seven final demand sectors.

The National Energy Accounts provide the flow data needed to construct these matrices, but in a form which does not entirely agree with U.S. Department of Commerce, Bureau of Economic Analysis conventions. (See, for example, Reference 1.) The interindustry flows of energy contained in the National Energy Accounts consist of various energy products from producing sectors and record transactions from these sectors to 155 consuming sectors.\* BEA, on the other hand, bases its input-output transactions on an 85-sector model of the economy. Of these 85 sectors, five are classified as energy producers. In addition, BEA recognizes 9 Final Demand Sectors. The consuming sectors utilized by NEA form a disaggregated version of sectors employed by BEA. One of the primary problems in producing the DET is the reaggregation of the NEA columns

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\*There are three other sectors (Imports, Exports, and Inventories) not found in the NEA data but available in Department of Energy Monthly Energy Reviews as well as Department of Energy, Energy Data Reports.



into conformable BEA columns.\* This process is not as simple as it first appears. If a consistent DET is to be produced, it is necessary that all NEA sectors be combined into the proper BEA sectors. Problems of disaggregating and reaggregating sectors to the proper specification involve a high degree of familiarization with both BEA and NEA conventions and definitions. A more in depth analysis of these problems is provided in reference [10].

Section 1.1 contains a description of the DET matrix. Section 1.2 discusses the National Energy Accounts. Section 1.3 describes the relationship between the BEA Use Matrix and the DET. Construction of the DET, including final demand sectors, is discussed in Section 2.0. Section 2.1 provides a simple algorithm for producing the DET. Section 2.2 compares total NEA consumption figures by sector with energy consumption figures obtained from sources independent of NEA. Table 7 of that section contains the 1977 DET. Calculation of factors used to determine primary energy use is described in Section 3.0. Section 4 contains energy intensities for 1977 based upon the 1977 DET. Calculation of factors used to determine primary energy use is described in Section 3.0. Section 4 contains energy intensities for 1977 based upon the 1977 DET.

### 1.1 The DET Matrix: Description

The Direct Energy Transactions Matrix shows the physical amounts of energy commodities sold to all energy-consuming sectors. According to BEA, only five sectors of the economy sell significant quantities of energy in energy form. These sectors are shown in the following table:

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\*The Energy Research Group (ERG) model unlike the BEA model breaks down Transportation from one to seven sectors; breaks down BEA Gas, Electric and Sanitary Services into the energy sectors Gas Utilities, and Electrical Utilities, and the non-energy sector Sanitary Services; and breaks down the Petroleum Refining and Related Products Sector into the energy sector Petroleum Refining, and two other products: Paving Mixtures and Blocks, and Asphalt Coatings.

Unlike the 1963 and 1967 DET's, ERG sectors 89 and 90 (Business Travel, Entertainment and Gifts, and Office Supplies) are no longer included. This is in line with new BEA sector definitions.



<u>BEA SECTOR NUMBER</u>	<u>NAME</u>	<u>SIC GROUPS CONTAINED</u>
7.0	Coal Mining	11, 12
8.0	Crude Petroleum and Natural Gas	13
31.01	Refined Petroleum	2911, 299
68.01	Electric Utilities	491, pt 493
68.02	Gas Utilities	492, pt 493

A complete list of the commodities associated with each of these sectors is shown in Appendix A, Table A2.

Of these five BEA energy sectors only Coal Mining, Crude Petroleum and Natural Gas, and Electric Utilities actually produce energy using direct inputs from the earth. The Gas Utilities and Refined Petroleum sectors merely transform and sell energy products which are extracted from the earth in the Crude Petroleum and Natural Gas sector. Energy produced by the Electrical Utilities sector which does not originate from hydroelectric, geothermal, nuclear, and renewable fuel plants also represents the transformation of primary energy sources.

Hence, within the DET, a significant quantity of energy is sold from the energy producing sector Crude Petroleum and Natural Gas, to the transforming and transferring energy sectors Refined Petroleum and Gas Utilities. Similarly, sales of this nature take place from the Refined Petroleum and Coal Mining Sector to the Electrical Utilities sector, providing fuel for coal and oil powered generating plants. Other sales of energy take place between energy sectors as well but these are, in general, quantities of energy used in the production process and, therefore, similar to the sales of energy from the five energy producing sectors to the non-energy producing consuming sectors.



All energy transactions are expressed in British Thermal Units (BTUs). Appendix B contains the BTU conversion factors utilized in the National Energy Accounts and in the report.\* Appendix A, Table A1, shows the correspondence between the 88-order ERG and BEA sectors to SIC and National Energy Account Sectors.

## 1.2 The National Energy Accounts and the DET

The National Energy Accounts, developed by Jack Faucett's Associates (JFA) for the Federal Energy Administration in November, 1975, has served as the basis for constructing the 1977 DET. The most recent version of the Accounts was completed by the Department of Commerce and consists of data which shows purchases and usage of various energy products by energy producing, intermediate, and final demand sectors of the U.S. economy. The major sources of data in this report are Tables E and F from the 1981 computer tape available from the Department of Commerce.

Specifically Table F shows energy consumed by industry. The National Energy Account consuming sectors constitute the column entries in this table. These column headings correspond to various aggregations of industries found in the Office of Management and Budget "Standard Industrial Classification Manual" (SIC). To produce a DET from the data in Table F, the 155 consuming sectors must be aggregated to conform to BEA definitions and all fuel forms, comprising rows, must be grouped into the five BEA energy sectors. BEA sectors are also based on the SIC manual so that in most cases aggregation of NEA into BEA sectors is

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\*Other BTU conversion factors can be found on the back cover of various Department of Energy "Monthly Energy Reviews."



simply a matter of adding rows or columns. Problems arise when an already aggregated NEA sector must be disaggregated to form two or more BEA sectors since a suitable means of disaggregation must be utilized. The problem of secondary products and proper product classification cause aggregation problems in forming the five BEA energy sectors.

### 1.3 The BEA Use Matrix and the DET

The five basic energy sectors utilized in this report are individually comprised of energy commodities which are primary to the particular sector. That is, energy products which are secondary to a particular industry are shown in the DET as being distributed by the energy sector to which it is primary. In this respect the DET corresponds to the BEA Use Matrix which shows sales of commodities to industries.

Hence, the DET is commodity based as opposed to industry based. In an industry based DET each of the five energy rows represents an energy producing industry. Each industry mainly produces products primary to itself, but also may produce secondary products (i.e., products considered primary to one of the other energy producing industries). Entries in an industry based DET must, therefore, be viewed with caution since they may represent sales of both primary and secondary products by particular industries.



## 2.0 Constructing the DET

The flow of energy products to industries and to final demand sectors represents the transactions shown in the DET. According to BEA, there are nine sectors which comprise the final demand sectors for the U.S. economy. These are:

<u>BEA SECTORS</u>	<u>SECTOR NAME</u>
91	Personal Consumption Expenditures
92	Gross Private Domestic Fixed Investment
93	Change in Business Inventories
94	Exports
95	Imports
96 & 97	Federal Government Purchases
98 & 99	State Government Purchases

With the addition of these sectors to the DET all energy consuming sectors in the economy are accounted for.

Data from the National Energy Accounts used to form the final demand component of the DET comes from 6 different columns of Table F as shown in the listing below:

<u>JFA SECTOR #</u>	<u>SECTOR NAME</u>
95009	Personal Consumption Expenditures
96700*	Gross Private Domestic Fixed Investment

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\*No direct energy is consumed in this sector by definition  
(Ref. Phone conversation with Hilary Kaufman, 11 July 1980)



JFA SECTOR #	SECTOR NAME
91009	
97100	Federal Government Purchases
97200	
92009	State and Local Gov. Purchases

When complete, the Final Demand Matrix will be of order 5 x 7 as shown below:

		FINAL DEMAND SECTOR						
		PCE	GPDFI	BI	Ex	Im	Fed.	State
P R O D U C T	Coal	-	-	-	-	-	-	-
	Refined Petroleum	-	-	-	-	-	-	-
	Crude & Natural Gas	-	-	-	-	-	-	-
	Electric Utilities	-	-	-	-	-	-	-
	Gas Utilities	-	-	-	-	-	-	-

Where PCE = Personal Consumption Expenditures

GPDFI = Gross Private Domestic Fixed Investment

BI = Change in Business Inventories

Ex = Exports

Im = Imports

Fed = Federal Government Purchases

State = State Government Purchases



The entire DET then appears as

COMMODITIES	INDUSTRIES	FINAL DEMAND SECTORS	TOTALS
Coal			
Refined Petroleum			
Crude & Natural Gas			
Electric Utilities			
Gas Utilities			

Sales of energy to consuming sectors include both domestically produced and imported energy. When imports are subtracted to avoid double counting, the totals on the right represent the total amount of domestic energy sold by commodity. Total consumption of energy by type can be found by adding industrial consumption, personal consumption, and Federal and State purchases of energy.



## 2.1 Program to Create the DET From the National Energy Accounts

Once energy consumption data for 1977 are isolated, two separate aggregations must be performed on the Table F data. First columns are aggregated according to BEA and ERG specifications. The correspondence between ERG and NEA sectors is shown in Appendix A, Table A1.

Aggregation of rows follows. Here the various energy products contained in the NEA are aggregated into the proper BEA energy-producing sectors, taking care to avoid double counting. The energy products contained in the NEA are listed in Appendix A, Table A2 along with their corresponding BEA sectors.

Special problems arise in dealing with energy flows to energy sectors. These problems are discussed in reference [10] and Appendix C.



## 2.2 Verification of Row Tables and Residual Allocation

Once the aggregation of energy forms is complete, there exist five rows representing energy flows from the five BEA energy sectors to all consuming sectors. By summing across each row for all consuming sectors, the row total or apparent consumption of each energy sector can be obtained.

For each of the five energy products it is possible to obtain data on total consumption from other sources independent of the NEA. To check whether the aggregation process utilized in producing the DET yields results which are compatible with these independent sources, a direct comparison is made and the percentage error for each sector is calculated.

Tables 1-6 show the row total for each sector obtained through the aggregation process utilized in producing the DET. Also shown are data for each energy product with total consumption figures derived from specified independent sources.

The errors determined in the verification process are allocated across respective industries proportionate to BTU usage so that consumption totals in the DET match independent source data. If energy consumption in a sector is known to be correct, no residual allocation is performed. This is the case for energy flows through energy sectors.

The 1977 DET is presented as Table 7. The residual corrected DET appears as Table 8. Direct energy use by final demand sectors is shown in Table 9 while Table 10 shows residual corrected final demand consumption of energy.



Table 1

NEA and Independent Source Energy Consumption by Sector  
 $(10^{12} \text{ Btu's})$

BEA Sector Codes	Independent Source Total Consumption	DET Consumption	Error	Percentage Error	Independent source of data
Coal 7.00	13979.0	13557.889	421.101	3.010	"Monthly Energy Review" DOE/EIA-0035 (82/05), page 6.
Crude Oil & Natural Gas 8.0	50424.935	50346.767	78.168	.1550	DOE/EIA-0035 (82/05) pages 6, 30, 31 DOE/EIA 0108/77, Table 2
Refined Petroleum 31.01	36381.885	35295.349	1086.536	2.986	"Monthly Energy Review" DOE/EIA-0035 (82/05), page 6.
Electricity 68.01	7321.246	7346.051	-24.805	-.3388	EEI Statistical Yearbook, 1979, Table 8.
Gas Utilities 68.02	18596.305	18158.688	437.617	2.353	"Monthly Energy Review" DOE/EIA-0035 (82/05), page 6.



Table 2

Coal Verification, DET Sector 1

DET DATA		INDEPENDENT SOURCE DATA <sup>2</sup>	
Total Consumption <sup>1</sup> :	13557.899	Total Consumption	13964.0
		Net Coke Imports	15.0
			TOTAL = 13979.0
		Error:	13979.0 - 13557.899 = 421.101
			Percentage Error = $\frac{421.101}{13979.0} \times 100 = 3.01$

## NOTES:

<sup>1</sup> Includes coke and breeze. See Note 1, Appendix C.

<sup>2</sup>"Monthly Energy Review," May 1982, DOE/EIA-0035 (82/05), page 6.



Table 3

Crude Oil and Natural Gas Verification, DET Sector 2  
 $(10^{12} \text{ BTU})$

DET DATA		INDEPENDENT SOURCE DATA	
Total Consumption:	50346.767	Total Crude <sup>1</sup>	30991.488
		Total Natural Gas <sup>2,*</sup>	19931.0
		Isopentane <sup>3</sup>	
		Natural Gasoline <sup>3</sup>	
		Plant Condensate <sup>3</sup>	
		Gases Vented and Flared <sup>4</sup>	149.530
		TOTAL	51812.133
		NET TOTAL*	50424.935
Error:	50424.935 - 50346.767	=	78.168
		Percentage Error =	$\frac{78.168}{50424.935} \times 100 = .155$

## NOTES:

<sup>1</sup>"Monthly Energy Review," DOE/EIA-0035 (82/05), pages 30-31.

<sup>2</sup>Ibid, page 6

<sup>3</sup>"Energy Data Report," DOE/EIA 0108/77, Table 2

<sup>4</sup>See Note 2A, Appendix C

\*The Net Total takes account of the Natural Gas sold and distributed by Sector 8 as a secondary product.



Table 4

## Petroleum Refining Verification, DET Sector 3

 $(10^{12} \text{ BTU})$ 

DET DATA		INDEPENDENT SOURCE DATA	
Total Consumption:	35295.349	Total Consumption	37122.0
		Isopentane	
		Natural Gasoline	740.115
		Plant Condensate	
		TOTAL	36381.885
Error:	36381.885 - 35295.349 = 1086.536		
		Percentage Error = $\frac{1086.536}{36381.885} \times 100 = 2.986$	

NOTES:

1 "Monthly Energy Review," May 1982, DOE/EIA-0035 (82/05), page 6.



Table 5

Electric Utilities Verification, DET Sector 4  
 $(10^{12} \text{ BTU})$

DET DATA	INDEPENDENT SOURCE DATA <sup>1</sup>
Total Consumption: 7346.051	Utility Generation 7248.064
	Industrials - for Sale to Electric Utility Industry 13.758
	Net Imports 59.423
	TOTAL 7321.246
Error: 7321.246 - 7346.051 = -24.805	Percentage error = $\frac{-24.805}{7321.246} \times 100 = .3388$

NOTES:

<sup>1</sup>Source: Edison Electric Institute "Statistical Yearbook," 1979, Table 8.



Table 6

## Gas Utilities Verification, DET Sector 5

DET DATA		INDEPENDENT SOURCE DATA	
Total Consumption:	18158.688	Dry Natural Gas <sup>1</sup>	19931.0
		-Gas Self Used by BEA Sector 8 <sup>2</sup>	-1610.673
		Coke Oven Gas <sup>3</sup>	275.978
		TOTAL	18596.305
Error:	18158.688 - 18596.305 = 437.617		
		Percentage Error = $\frac{437.617}{18596.305} \times 100 = 2.353$	

## NOTES:

<sup>1</sup>"Monthly Energy Review," May 1982, DOE/EIA-0035 (82/05) page 6.

<sup>2</sup>See Appendix C, Table 3. Total does not include gases vented and flared.

<sup>3</sup>Represents Coke Oven Gas Sold. Source: DOE/EIA-0120/77.



Table 7. The 1977 DIRECT ENERGY TRANSACTIONS MATRIX

( $10^{12}$  BTU)

I-O CODE	SECTOR	COAL	CRUDE	REFINED	ELECTRIC	GAS
1 700	COAL MINING	58.538	0.000	70.399	35.262	1.842
2 800	CRUDE PETRO, GAS	0.000	1760.203	186.896	65.614	157.230
3 3101	PETRO REFIN PROD	3.737	31653.635	2104.954	106.563	933.082
4 6801	ELECTRIC UTIL	10243.000	0.000	4028.000	664.770	3284.000
5 6802	GAS UTILITIES	0.000	16933.128	7.513	24.496	1195.000
6 100	LIVESTOCK	.799	0.000	410.893	35.726	5.197
7 200	MISC AG PRODUCTS	0.000	0.000	881.132	79.896	174.976
8 300	FOREST FISH PROD	0.000	0.000	103.223	0.000	0.000
9 400	AG FOR, FISH SER	0.000	0.000	48.488	0.000	0.000
10 500	IRON ORE MINING	14.514	0.000	17.308	19.722	52.143
11 600	NONFERR MINING	4.254	0.000	28.322	22.538	22.957
12 900	STONE CLAY MIN	8.460	0.000	62.072	20.231	48.209
13 1000	CHEM MINERAL MIN	4.782	0.000	17.946	13.751	106.290
14 1100	NEW CONSTRUCTION	0.000	0.000	868.603	11.987	5.882
15 1200	MAINT, REP CONST	0.000	0.000	264.735	0.000	0.000
16 1300	ORDNANCE	1.269	0.000	11.303	8.902	11.878
17 1400	FOOD	86.368	0.000	356.611	136.645	466.534
18 1500	TOBACCO	1.669	0.000	12.557	4.265	3.174
19 1600	FABRIC & MILLS	26.367	0.000	76.954	70.424	42.496
20 1700	TEXTILE GOODS	2.256	0.000	20.311	11.011	27.238
21 1800	APPAREL	2.092	0.000	50.033	30.682	26.624
22 1900	FAB TEXTILE PROD	.964	0.000	5.672	4.682	8.090
23 2000	WOOD PRODUCTS	7.761	0.000	143.649	53.418	65.946
24 2100	WOOD CONTAINERS	0.000	0.000	4.450	.689	.102
25 2200	H'OLD FURNITURE	2.797	0.000	9.285	9.564	9.011
26 2300	FURN, FIXTURES	.423	0.000	10.280	4.733	12.698
27 2400	PAPER PRODUCTS	204.427	0.000	511.241	140.364	340.787
28 2500	PAPERBOARD CONT	.917	0.000	27.659	11.683	23.347
29 2600	PRINTING, PUBL	5.288	0.000	70.053	36.012	33.894
30 2700	CHEM PRODUCTS	205.285	0.000	1262.586	398.309	1002.574
31 2800	PLASTICS	106.174	0.000	280.362	63.409	109.261
32 2900	DRUGS, TOIL PREP	10.176	0.000	63.839	19.992	31.846
33 3000	PAINTS	0.000	0.000	27.320	3.463	6.349
34 3102	PAVING	.355	0.000	152.071	2.238	14.135
35 3103	ASPHALT	.389	0.000	166.305	2.447	15.459
36 3200	RUBBER PRODUCTS	24.417	0.000	89.834	76.969	83.251
37 3300	LEATHER PRODUCTS	1.058	0.000	7.543	1.266	4.198
38 3400	FOOTWEAR	.165	0.000	6.614	3.569	2.458
39 3500	GLASS PRODUCTS	.353	0.000	49.079	30.478	203.264
40 3600	STONE CLAY PROD	324.671	0.000	156.622	75.044	360.960
41 3700	PRIM IR, STL MANU	1819.261	0.000	306.391	250.332	811.604
42 3800	PRIM NONFER MET	33.096	0.000	65.003	316.809	339.251
43 3900	METAL CONTAINERS	.799	0.000	4.551	7.476	23.552
44 4000	HEATING, PLUMBING	1.920	0.000	21.676	20.712	41.574
45 4100	SCREW MACH PROD	3.666	0.000	13.121	21.394	35.021
46 4200	FAB METAL PROD	5.079	0.000	27.260	31.112	66.253
47 4300	ENGINES, TURBINES	.733	0.000	10.995	8.025	10.854



Table 7. The 1977 Direct Energy Transactions Matrix (continued)

(10<sup>12</sup> BTU)

I-O CODE	SECTOR	COAL	CRUDE	REFINED	ELECTRIC	GAS
48 4400	FARM MACHINERY	5.607	0.000	7.553	7.131	19.046
49 4500	CONST, MINING EQ	6.989	0.000	6.570	14.301	28.058
50 4600	MAT HANDLING EQ	0.000	0.000	5.858	2.996	4.915
51 4700	METALWORKING EQ	1.934	0.000	10.850	12.748	16.077
52 4800	SPEC IND MACH	.239	0.000	9.150	6.869	8.806
53 4900	GEN IND MACH	1.543	0.000	12.183	15.532	25.190
54 5000	MACH SHOP PROD	.782	0.000	7.436	10.192	14.438
55 5100	OFC, COMPUT MACH	1.081	0.000	14.430	9.561	6.246
56 5200	SERVICE IND MACH	2.615	0.000	10.154	9.694	15.667
57 5300	ELEC IND APPARAT	1.434	0.000	18.299	21.876	25.190
58 5400	H' HOLD APPLIANCE	4.213	0.000	8.714	9.257	19.354
59 5500	ELEC LIGHT EQ	2.495	0.000	8.275	7.961	11.776
60 5600	R-TV COMMUN EQ	2.609	0.000	16.957	18.962	17.715
61 5700	ELECTRONIC COMP	2.233	0.000	13.236	20.490	12.595
62 5800	ELECTRICAL EQUIP	1.649	0.000	8.191	8.947	10.854
63 5900	MOTOR VEH & EQ	41.309	0.000	50.636	65.794	106.394
64 6000	AIRCRAFT & PARTS	4.583	0.000	24.768	23.957	22.016
65 6100	TRANSPORT EQUIP	3.457	0.000	21.929	12.151	13.722
66 6200	PROF SCIENT SUPP	1.152	0.000	10.167	10.349	10.547
67 6300	OPTICAL SUPPLIES	5.429	0.000	24.152	6.336	12.083
68 6400	MISC MANUFACT	3.361	0.000	30.196	14.068	17.306
69 6501	RAILROAD	7.027	0.000	627.323	5.808	0.000
70 6502	LOCAL TRANSPORT	0.000	0.000	192.657	8.841	.282
71 6503	MOTOR FGT TRANSP	0.000	0.000	975.873	10.366	10.527
72 6504	WATER TRANSPORT	12.879	0.000	977.126	.194	.198
73 6505	AIR TRANSPORT	0.000	0.000	1297.801	3.603	3.658
74 6506	PIPE LINE TRANSP	0.000	0.000	30.500	71.103	30.055
75 6507	TRANSP SERVICES	0.000	0.000	9.281	.877	.892
76 6600	COMMUNICATIONS	0.000	0.000	34.781	37.647	8.799
77 6700	R-TV BROADCAST	0.000	0.000	7.138	9.844	2.201
78 6803	WATER, SANIT SER	0.000	0.000	42.619	0.000	0.000
79 6900	WHOLE, RETAIL TR	0.000	0.000	1435.844	693.919	423.899
80 7000	FINANCE INSUR	0.000	0.000	209.445	49.811	26.797
81 7100	REAL ESTATE	0.000	0.000	36.618	29.638	27.921
82 7200	HOTELS, PERS SER	0.000	0.000	253.829	160.721	261.670
83 7300	BUSINESS SERVICE	0.000	0.000	210.920	87.100	49.067
84 7500	AUTO REPAIR	0.000	0.000	48.146	118.808	106.170
85 7600	AMUSEMENTS	0.000	0.000	73.880	40.520	25.233
86 7700	MED, EDUC SER	0.000	0.000	1079.133	243.006	668.188
87 7800	FED GOVT ENTERP	0.000	0.000	38.480	8.425	41.732
88 7900	ST, LOC GOVT ENT	0.000	0.000	50.723	6.889	30.921



Table 8. The 1977 Direct Energy Transactions Matrix With Residuals Allocated  
 $(10^{12} \text{ BTU})$

	I-O CODE	SECTOR	COAL	CRUDE	REFINED	ELECTRIC	GAS
1	700	COAL MINING	58.538	0.000	70.399	35.262	1.842
2	800	CRUDE PETRO, GAS	0.000	1760.203	186.896	65.614	157.230
3	3101	PETRO REFIN PROD	3.737	31653.436	2104.954	106.563	933.082
4	6801	ELECTRIC UTIL	10243.000	0.000	4028.000	664.770	3284.000
5	6802	GAS UTILITIES	0.000	16933.128	7.513	24.496	1195.000
6	100	LIVESTOCK	.910	0.000	426.342	35.589	5.378
7	200	MISC AG PRODUCTS	0.000	0.000	914.262	79.589	181.066
8	300	FOREST FISH PROD	0.000	0.000	107.104	0.000	0.000
9	400	AG FOR, FISH SER	0.000	0.000	50.311	0.000	0.000
10	500	IRON ORE MINING	16.533	0.000	17.959	19.646	53.958
11	600	NONFERR MINING	4.846	0.000	29.387	22.451	23.756
12	900	STONE CLAY MIN	9.637	0.000	64.406	20.153	49.887
13	1000	CHEM MINERAL MIN	5.447	0.000	18.621	13.698	109.989
14	1100	NEW CONSTRUCTION	0.000	0.000	901.262	11.941	6.087
15	1200	MAINT, REP CONST	0.000	0.000	274.689	0.000	0.000
16	1300	ORDNANCE	1.446	0.000	11.728	8.868	12.291
17	1400	FOOD	98.381	0.000	370.019	136.119	482.771
18	1500	TOBACCO	1.901	0.000	13.029	4.249	3.284
19	1600	FABRIC & MILLS	30.034	0.000	79.847	70.153	43.975
20	1700	TEXTILE GOODS	2.570	0.000	21.075	10.969	28.186
21	1800	APPAREL	2.383	0.000	51.914	30.564	27.551
22	1900	FAB TEXTILE PROD	1.098	0.000	5.885	4.664	8.372
23	2000	WOOD PRODUCTS	8.840	0.000	149.050	53.213	68.241
24	2100	WOOD CONTAINERS	0.000	0.000	4.617	.686	.106
25	2200	H'OLD FURNITURE	3.186	0.000	9.634	9.527	9.325
26	2300	FURN, FIXTURES	.482	0.000	10.667	4.715	13.140
27	2400	PAPER PRODUCTS	232.860	0.000	530.463	139.824	352.647
28	2500	PAPERBOARD CONT	1.045	0.000	28.699	11.638	24.160
29	2600	PRINTING, PUBL	6.023	0.000	72.687	35.873	35.074
30	2700	CHEM PRODUCTS	233.837	0.000	1310.059	396.777	1037.467
31	2800	PLASTICS	120.941	0.000	290.903	63.165	113.064
32	2900	DRUGS, TOIL PREP	11.591	0.000	66.239	19.915	32.954
33	3000	PAINTS	0.000	0.000	28.347	3.450	6.570
34	3102	PAVING	.404	0.000	157.789	2.229	14.627
35	3103	ASPHALT	.443	0.000	172.558	2.438	15.997
36	3200	RUBBER PRODUCTS	27.813	0.000	93.212	76.673	86.148
37	3300	LEATHER PRODUCTS	1.205	0.000	7.827	1.261	4.344
38	3400	FOOTWEAR	.188	0.000	6.863	3.555	2.544
39	3500	GLASS PRODUCTS	.402	0.000	50.924	30.361	210.338
40	3600	STONE CLAY PROD	369.828	0.000	162.511	74.755	373.523
41	3700	PRIM IR, STL MANU	2072.295	0.000	317.911	249.369	839.850
42	3800	PRIM NONFER MET	37.699	0.000	67.447	315.591	351.058
43	3900	METAL CONTAINERS	.910	0.000	4.722	7.447	24.372
44	4000	HEATING, PLUMBING	2.187	0.000	22.491	20.632	43.021
45	4100	SCREW MACH PROD	4.176	0.000	13.614	21.312	36.240
46	4200	FAB METAL PROD	5.785	0.000	28.285	30.992	68.559
47	4300	ENGINES, TURBINES	.835	0.000	11.408	7.994	11.232

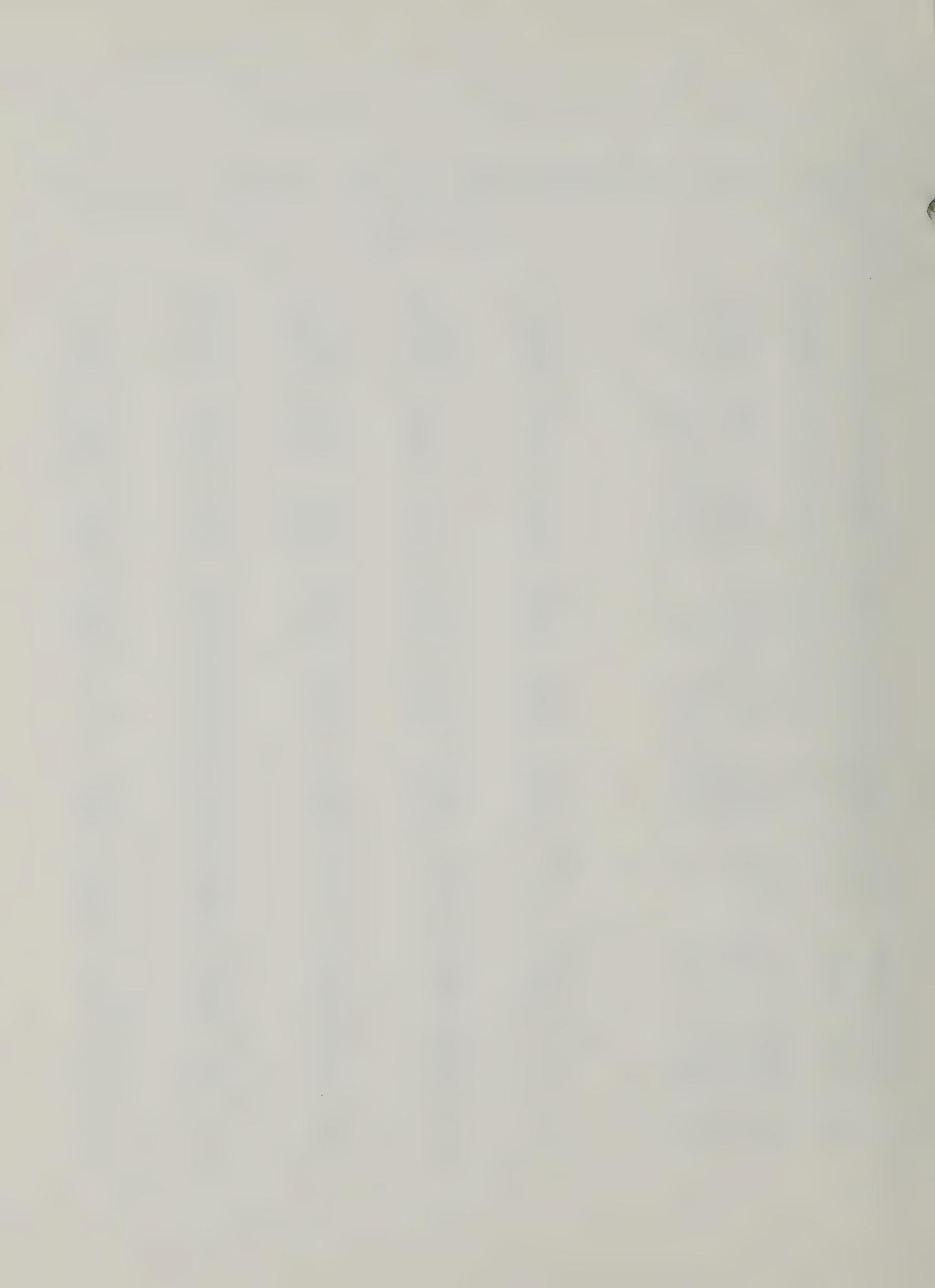


Table 8. The 1977 Direct Energy Transactions Matrix With Residuals Allocated (continued)

$(10^{12})$  BTU

	I-O CODE	SECTOR	COAL	CRUDE	REFINED	ELECTRIC	GAS
48	4400	FARM MACHINERY	6.387	0.000	7.837	7.104	19.709
49	4500	CONST, MINING EQ	7.961	0.000	6.817	14.246	29.035
50	4600	MAT HANDLING EQ	0.000	0.000	6.078	2.984	5.086
51	4700	METALWORKING EQ	2.203	0.000	11.258	12.699	16.637
52	4800	SPEC IND MACH	.272	0.000	9.494	6.843	9.112
53	4900	GEN IND MACH	1.758	0.000	12.641	15.472	26.067
54	5000	MACH SHOP PROD	.891	0.000	7.716	10.153	14.940
55	5100	OFC, COMPUT MACH	1.231	0.000	14.973	9.524	6.463
56	5200	SERVICE IND MACH	2.979	0.000	10.536	9.657	16.212
57	5300	ELEC IND APPARAT	1.633	0.000	18.987	21.792	26.067
58	5400	H'OLD APPLIANCE	4.799	0.000	9.042	9.221	20.028
59	5500	ELEC LIGHT EQ	2.842	0.000	8.586	7.930	12.186
60	5600	R-TV COMMUN EQ	2.972	0.000	17.595	18.889	18.332
61	5700	ELECTRONIC COMP	2.544	0.000	13.734	20.411	13.033
62	5800	ELECTRICAL EQUIP	1.878	0.000	8.499	8.913	11.232
63	5900	MOTOR VEH & EQ	47.055	0.000	52.540	65.541	110.097
64	6000	AIRCRAFT & PARTS	5.220	0.000	25.699	23.865	22.782
65	6100	TRANSPORT EQUIP	3.938	0.000	22.754	12.104	14.200
66	6200	PROF SCIENT SUPP	1.312	0.000	10.549	10.309	10.914
67	6300	OPTICAL SUPPLIES	6.184	0.000	25.060	6.312	12.504
68	6400	MISC MANUFACT	3.828	0.000	31.331	14.014	17.908
69	6501	RAILROAD	8.004	0.000	650.910	5.786	0.000
70	6502	LOCAL TRANSPORT	0.000	0.000	199.901	8.807	.292
71	6503	MOTOR FGT TRANSP	0.000	0.000	1012.565	10.326	10.893
72	6504	WATER TRANSPORT	14.670	0.000	1013.865	.193	.205
73	6505	AIR TRANSPORT	0.000	0.000	1346.598	3.589	3.785
74	6506	PIPE LINE TRANSP	0.000	0.000	31.647	70.830	31.101
75	6507	TRANSP SERVICES	0.000	0.000	9.630	.874	.923
76	6600	COMMUNICATIONS	0.000	0.000	36.089	37.502	9.105
77	6700	R-TV BROADCAST	0.000	0.000	7.406	9.806	2.278
78	6803	WATER, SANIT SER	0.000	0.000	44.221	0.000	0.000
79	6900	WHOLE, RETAIL TR	0.000	0.000	1489.831	691.250	438.652
80	7000	FINANCE INSUR	0.000	0.000	217.320	49.619	27.730
81	7100	REAL ESTATE	0.000	0.000	37.995	29.524	28.893
82	7200	HOTELS, PERS SER	0.000	0.000	263.373	160.103	270.777
83	7300	BUSINESS SERVICE	0.000	0.000	218.850	86.765	50.775
84	7500	AUTO REPAIR	0.000	0.000	49.956	118.351	109.865
85	7600	AMUSEMENTS	0.000	0.000	76.658	40.364	26.111
86	7700	MED, EDUC SER	0.000	0.000	1119.708	242.071	691.443
87	7800	FED GOVT ENTERP	0.000	0.000	39.927	8.393	43.184
88	7900	ST, LOC GOVT ENT	0.000	0.000	52.630	6.863	31.997

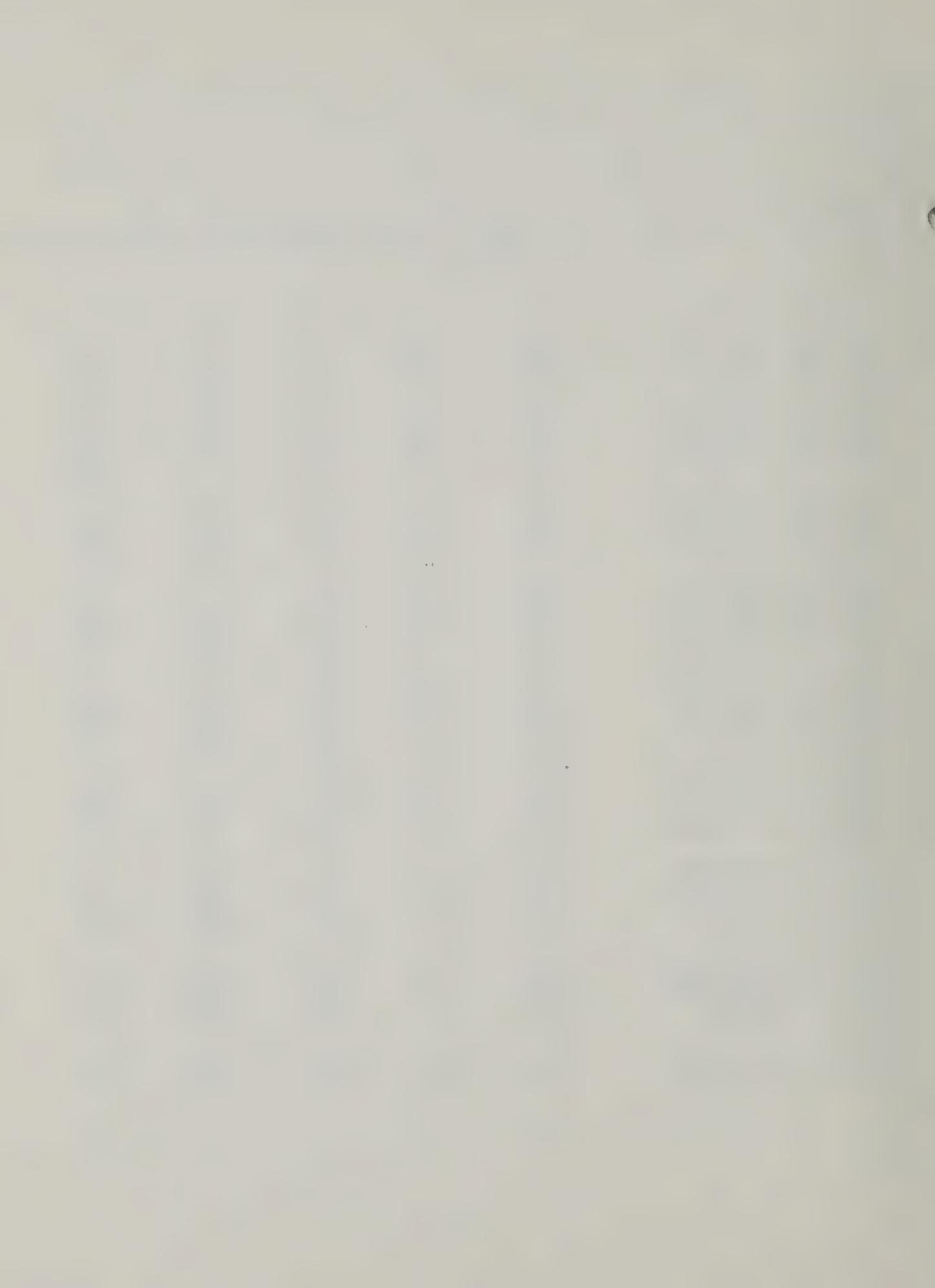


Table 9.  
DIRECT ENERGY USE BY FINAL DEMAND SECTORS <sup>†</sup>  
1974

(10<sup>12</sup> BTU)

Final Energy Demand Commodity Sector (BEA Sector)	Personal Consumption Expenditures	Gross Private Fixed Investment*	Net Inventory Change <sup>2</sup>	Exports <sup>4</sup>	Imports <sup>4</sup>	Federal Government Purchase	State Government Purchase	Totals <sup>5</sup> Consumption
7**	212.645	0.0	532.51	1307.099	84.064	12.355	0.0	13557.899
8†	0.0	0.0	361.282 <sup>3</sup>	106.471	14086.699	0.0	0.0	50346.767
21	12676.324	0.0	678.548	404.233	4574.699	895.675	649.815	35295.349
31.01	2301.425	0.0	0.0	9,363	68.786	38.483	153.177	7346.051
68.01	5553.810	0.0	625.873	57.176	1032.231	67.044	181.138	18158.688

\* 0 for energy products by definition.

\*\* Includes coal equivalent of coke.

† Before residual allocation.

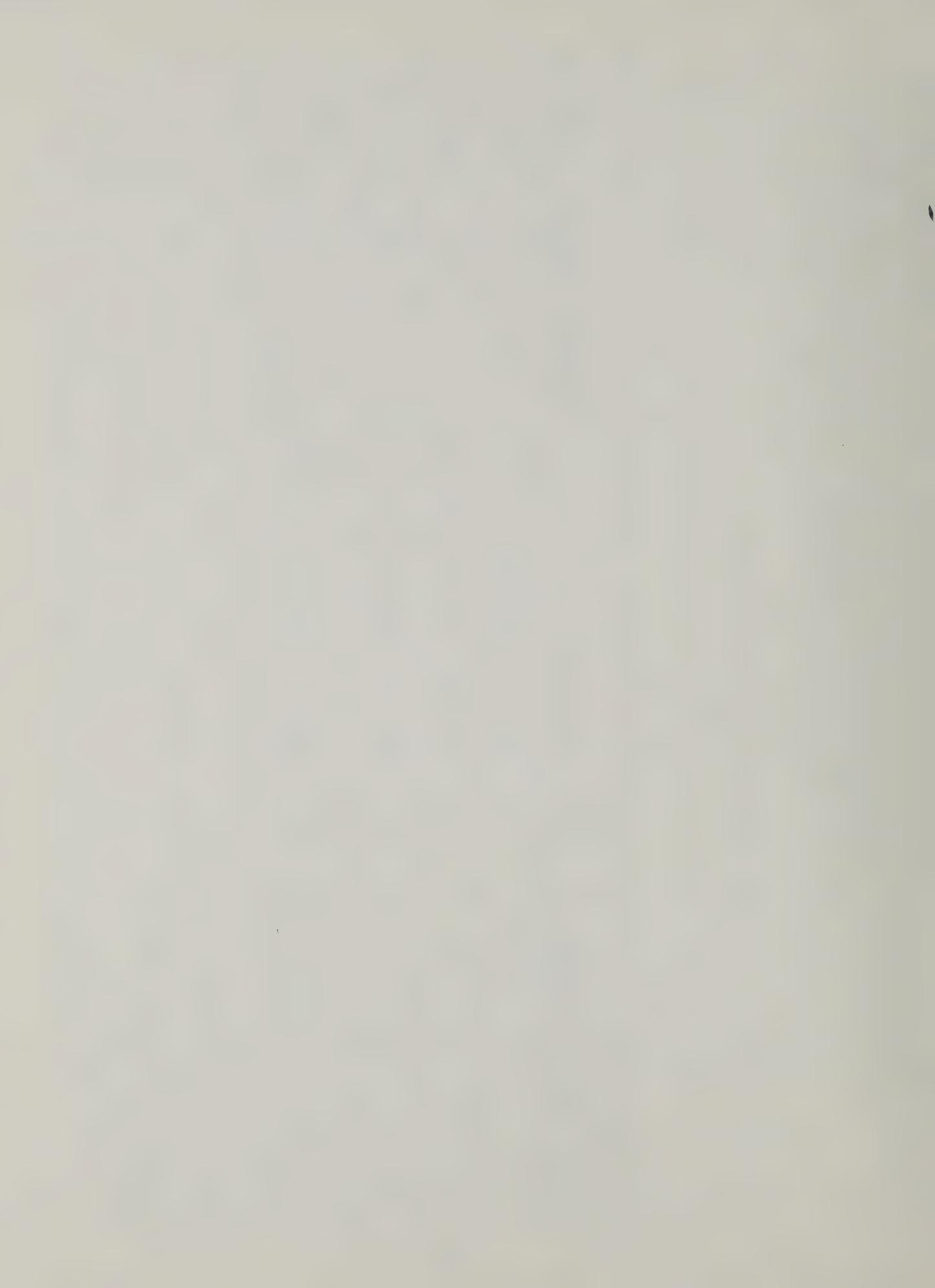


Table 10.

RESIDUAL CORRECTED  
FINAL DEMAND CONSUMPTION  $10^{12}$  BTU

BEA Sector	Personal Consumption Expenditures	Federal Government Expenditures	State Government Expenditures	Total
7	212.645	12.355	0	225.00
8	0	0	0	0
31.01	13152.948	929.352	674.248	14756.548
68.01	2292.573	38.335	152.88	2483.496
68.02	5747.101	69.377	187.442	6003.92



## FINAL DEMAND NOTES

1. Includes Plant Condensate, Natural Gasoline, and Isopentane.

2. Sources of Data

Coal - Coal Stocks, page 63, DOE/EIA - 0035 (82/05).

Crude Oil and Natural Gas - Tables 1 and 2 DOE/EIA 0108/77,  
Tables 1 and 21 DOE/EIA 0131/78.

Refined - DOE/EIA - 0108/77, Table 20.

Gas Utilities - Natural Gas in Underground Storage, page 52,  
DOE/EIA - 0035 (82/05)

3. Includes  $43.732 \cdot 10^{12}$  BTU of crude input to the Strategic Petroleum Reserve.  
See Table 1, DOE/EIA - 0108/77.

4. Sources of Data

Coal: DOE/EIA - 0035 (82/05) page 60

Coke: DOE/EIA - 0120/77

Crude Oil and Natural Gas - DOE/EIA 0108/77 Table 1 (Isopentane etc.)  
DOE/EIA - 0035 (82/05) page 31

Refined Petroleum - DOE/EIA 0108/77 Tables 23 and 25

Electricity - EEI "Statistical Yearbook 1979" Table 8

Gas Utilities - DOE/EIA - 0035 (82/05) page 50.

5. Total Consumption = Industrial Consumption + Personal Consumption +  
Federal and State Purchases.



### 3.0 CALCULATION OF $\alpha$ 's FOR THE DETERMINATION OF PRIMARY ENERGY

Primary energy is defined as energy from some fundamental source such as an oil well, the sun, water power, or energy released from atomic reactors. The  $\alpha$  fractions developed by the Energy Research Group provide a means of determining the total primary energy per unit of output of a particular commodity.\* Given five types of energy  $i$ , and some commodity  $j$ ,  $\epsilon_{ij}$  represents the total BTUs of energy type  $i$  embodied in a unit of output of commodity  $j$ . If all five energy commodities were primary  $\sum_{i=1}^5 \epsilon_{ij}$  would represent the total primary energy of all types per unit of output of commodity  $j$ .

However, some energy products are comprised of other more primary types of energy. For example, refined petroleum products are comprised of crude oil, electricity is largely produced using coal and crude oil, and the gas sold by gas utilities is first pumped out of the ground in the crude oil and natural gas sector. Hence in forming an energy intensity which will capture only primary energy, it is necessary to multiply each  $\epsilon_{ij}$  by a factor,  $\alpha_i$ , which represents the portion of energy product  $i$  which is truly primary.

For coal, and crude oil and natural gas  $\alpha_i$  is 1 since the entire output of these commodities originates in the earth. For refined petroleum products, and gas utilities  $\alpha_i$  is defined as the fraction of output comprised of the primary energy products, coal, and crude oil and natural gas. Electricity poses a special problem because of nuclear and hydro power. The derivation of the  $\alpha_i$  for

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\* Units of output are dollars for non-energy commodities and BTUs for energy commodities.



electricity is found in ERG Technical Memo 122 by Hannon, Herendeen and Penner.

For the  $j^{\text{th}}$  commodity the primary  $\varepsilon$  is defined as

$$\sum_{i=1}^5 \alpha_i \varepsilon_{ij} = \alpha_1 \varepsilon_{1j} + \alpha_2 \varepsilon_{2j} + \alpha_3 \varepsilon_{3j} + \alpha_4 \varepsilon_{4j} + \alpha_5 \varepsilon_{5j}$$

where the numerical subscripts refer to the following sectors:

- 1 = coal
- 2 = crude oil and natural gas
- 3 = refined petroleum
- 4 = electricity
- 5 = gas utilities

For 1977 the  $\alpha$  vector appears as

$$\begin{aligned}\alpha_1 &= 1 \\ \alpha_2 &= 1 \\ \alpha_3 &= .05310 \\ \alpha_4 &= .6794 \\ \alpha_5 &= .0696\end{aligned}$$



#### 4.0 Calculation of the Energy Intensities for 1977.

Since we do not have a full BEA I-O model for 1977, we must approximate the 1977 energy intensities. To do this we normalized the 1977 DET by the 1977 industrial output. These output values are available from the Bureau of Labor Statistics data tape titled "Time Series Data for Input-Output Industries." The normalized DET was substituted into the 1972 B matrix and combined with the 1972 V as described in ERG Document 307 to form a set of approximate 1977 energy intensities (see Table 11). This procedure has proven to be very accurate when applied to past I-O years (see Document 317). For reference we have included a breakdown of Final Demand for 1977 (see Table 12).



Table 11. ENERGY INTENSITIES ( $\epsilon$ ) 1977 (Estimated)  
 BTU/BTU Energy Commodities;  
 BTU/1972\$ of Output - All Other Commodities

I-O Code	COMMODITY	Coal	Crude Petroleum & Nat. Gas		Refined Petroleum Electricity	Natural Gas	Primary*
1	700 COAL MINING	1.0090	.0113	.0083	.0031	.0030	1.0230
2	800 CRUDE PETRO, GAS	.0041	1.0630	.0085	.0024	.0069	1.0697
3	3101 PETRO REFIN PROD	.0143	1.0799	1.0837	.0089	.0443	1.1609
4	6801 ELECTRIC UTIL	1.5827	1.2275	.6974	1.1161	.5748	3.6454
5	6802 GAS UTILITIES	.0072	1.0562	.0119	.0044	1.0784	1.1420
6	100 LIVESTOCK	8577.	51262.	38450.	4855.	11172.	65957.
7	200 MISC AG PRODUCTS	10337.	67973.	44905.	5969.	17288.	85953.
8	300 FOREST FISH PROD	6578.	73110.	64706.	3036.	8806.	85800.
9	400 AG FOR, FISH SER	6552.	43432.	32261.	3313.	8760.	54558.
10	500 IRON ORE MINING	46727.	97797.	36497.	20554.	62473.	164775.
11	600 NONFERR MINING	27512.	61032.	32642.	15087.	26705.	102385.
12	900 STONE CLAY MIN	22791.	68025.	38415.	10336.	30408.	101994.
13	1000 CHEM MINERAL MIN	44055.	219756.	49495.	23373.	175449.	294529.
14	1100 NEW CONSTRUCTION	13296.	35061.	22953.	4490.	11929.	53456.
15	1200 MAINT, REP CONST	7788.	30290.	21797.	2862.	7970.	41735.
16	1300 ORDNANCE	13557.	23208.	11717.	5032.	11053.	41575.
17	1400 FOOD	10919.	44765.	27955.	5217.	15721.	61808.
18	1500 TOBACCO	5284.	24069.	16196.	2793.	6582.	32569.
19	1600 FABRIC & MILLS	25026.	72798.	39687.	12361.	24305.	110022.
20	1700 TEXTILE GOODS	21140.	71892.	37344.	10284.	25817.	103798.
21	1800 APPAREL	13137.	39445.	22483.	6804.	13280.	59322.
22	1900 FAB TEXTILE PROD	16733.	49872.	27287.	8310.	17596.	74924.
23	2000 WOOD PRODUCTS	12669.	44593.	30092.	6466.	13904.	64220.
24	2100 WOOD CONTAINERS	12738.	40285.	30069.	5625.	10555.	59176.
25	2200 H'HOLD FURNITURE	13678.	33835.	19369.	6007.	12893.	53520.
26	2300 FURN, FIXTURES	17983.	36858.	19432.	5984.	16496.	61086.
27	2400 PAPER PRODUCTS	35317.	97844.	57819.	13299.	38100.	147919.
28	2500 PAPERBOARD COMF	20191.	61756.	36147.	8496.	23441.	91271.
29	2600 PRINTING, PUBL	11172.	34617.	21071.	5183.	12137.	51274.
30	2700 CHEM PRODUCTS	48061.	252943.	95602.	24156.	76314.	327803.
31	2800 PLASTICS	43317.	156179.	78732.	17917.	49639.	219305.
32	2900 DRUGS, TOIL PREP	12937.	49617.	24888.	6201.	16576.	69242.
33	3000 PAINTS	21659.	96363.	46652.	10151.	29325.	129437.
34	3102 PAVING	13691.	218321.	192664.	6903.	33019.	249230.
35	3103 ASPHALT	16723.	245952.	213592.	7940.	37513.	282022.
36	3200 RUBBER PRODUCTS	21362.	65035.	33363.	10079.	23199.	96631.
37	3300 LEATHER PRODUCTS	13434.	60009.	33585.	6416.	20433.	81007.
38	3400 FOOTWEAR	10332.	34558.	19577.	5115.	11886.	50232.
39	3500 GLASS PRODUCTS	16300.	82766.	27656.	9538.	54525.	110810.
40	3600 STONE CLAY PROD	42988.	77455.	34949.	9602.	41810.	131732.
41	3700 PRIM IR,STL MANU	91535.	78937.	32515.	13761.	45928.	184744.
42	3800 PRIM NONFER MET	47503.	84020.	35050.	28519.	48376.	156127.
43	3900 METAL CONTAINERS	40959.	55462.	25236.	10246.	29429.	106771.
44	4000 HEATING,PLUMBING	32571.	43368.	19988.	8810.	23036.	84589.
45	4100 SCREW MACH PROD	33414.	41502.	18519.	8498.	22464.	83236.
46	4200 FAB METAL PROD	29284.	44082.	19820.	8850.	23007.	82032.
47	4300 ENGINES,TURBINES	23539.	32558.	15638.	7103.	16934.	62932.
48	4400 FARM MACHINERY	23355.	32475.	14914.	6180.	17335.	62027.
49	4500 CONST, MINING EQ	24066.	31426.	13895.	6478.	17416.	61844.
50	4600 MAT HANDLING EQ	21672.	30932.	15360.	6095.	15432.	58634.
51	4700 METALWORKING EQ	18392.	26232.	12340.	5875.	13668.	50222.
52	4800 SPEC IND MACH	18085.	30560.	14850.	5963.	14224.	54475.
53	4900 GEN IND MACH	22270.	31593.	14684.	6829.	16843.	60454.
54	5000 MACH SHOP PROD	19227.	29919.	14093.	6901.	15649.	55671.
55	5100 OFC, COMPUT MACH	11160.	23665.	13591.	5121.	9647.	39697.



Table 11 (continued)

I-O Code	COMMODITY	Coal	Crude Petroleum & Nat. Gas		Refined Petroleum	Electricity	Natural Gas	Primary*
56	5200 SERVICE IND MACH	19345.	31594.	15198.	6846.	15799.	57496.	
57	5300 ELEC IND APPARAT	18588.	32167.	15678.	7551.	15848.	57821.	
58	5400 H'OLD APPLIANCE	20676.	35989.	17016.	7122.	17739.	63642.	
59	5500 ELEC LIGHT EQ	18096.	34135.	16173.	7018.	16688.	59019.	
60	5600 R-TV COMMUN EQ	10472.	21690.	11511.	5026.	9679.	36861.	
61	5700 ELECTRONIC COMP	14192.	30140.	15225.	7049.	13465.	50866.	
62	5800 ELECTRICAL EQUIP	18633.	37997.	18072.	8829.	17866.	64832.	
63	5900 MOTOR VEH & EQ	21624.	33275.	15921.	6581.	16600.	61370.	
64	6000 AIRCRAFT & PARTS	12311.	22842.	12320.	5441.	10376.	40226.	
65	6100 TRANSPORT EQUIP	20193.	33577.	17575.	6491.	15379.	60184.	
66	6200 PROF SCIENT SUPP	12845.	26733.	14038.	5754.	11929.	45063.	
67	6300 OPTICAL SUPPLIES	11754.	33799.	17689.	5081.	12738.	50831.	
68	6400 MISC MANUFACT	15609.	37589.	20722.	6826.	14928.	59975.	
69	6501 RAILROAD	5597.	59392.	55874.	2136.	5460.	69787.	
70	6502 LOCAL TRANSPORT	5876.	40404.	35984.	3155.	5362.	50708.	
71	6503 MOTOR FGT TRANSP	3393.	48338.	45500.	1915.	4536.	55765.	
72	6504 WATER TRANSPORT	9558.	205752.	202286.	3242.	11901.	229083.	
73	6505 AIR TRANSPORT	4143.	118991.	116473.	2381.	7343.	131448.	
74	6506 PIPE LINE TRANSP	71670.	101157.	56059.	49949.	48617.	213123.	
75	6507 TRANSP SERVICES	2512.	13137.	10565.	1489.	2835.	17419.	
76	6600 COMMUNICATIONS	2967.	6391.	4318.	1865.	2146.	11003.	
77	6700 R-TV BROADCAST	6505.	14577.	9951.	4317.	4838.	24879.	
78	6803 WATER, SANIT SER	6204.	30382.	21855.	2229.	7745.	39800.	
79	6900 WHOLE, RETAIL TR	6288.	18814.	13131.	4014.	6015.	28945.	
80	7000 FINANCE INSUR	3025.	10943.	8125.	1826.	2981.	15847.	
81	7100 REAL ESTATE	1193.	4090.	2763.	607.	1266.	5930.	
82	7200 HOTELS, PERS SER	12549.	37042.	19947.	7910.	17292.	57229.	
83	7300 BUSINESS SERVICE	5595.	17144.	11431.	3101.	5444.	25832.	
84	7500 AUTO REPAIR	16192.	29124.	14222.	8355.	14923.	52787.	
85	7600 AMUSEMENTS	8238.	24116.	16544.	5414.	7718.	37448.	
86	7700 MED, EDUC SER	7127.	35178.	21756.	4533.	13870.	47506.	
87	7800 FED GOVT ENTERP	2481.	17139.	11335.	1500.	6247.	21675.	
88	7900 ST, LOC GOVT ENT	5843.	30855.	18715.	2921.	10272.	40391.	

\* Formed by  $\epsilon^P = \alpha \cdot \epsilon^i$  where i is FIVE ENERGY TYPES &  $\alpha = 1.0, 1.0, 0.0531, 0.6794, 0.0696$



Table 12. FINAL DEMAND COMPOSITION FOR 1977 (in 1972 dollars).

1-0 Code		Commodity		Personal Consumption Expenditures		Gross Private Fixed Investment		Net Inventory Change		Exports		Imports		Federal Government Purchases		State & Local Government Purchases	
1	700	COAL MINING		.102655E+09	0.	.234251E+09		.105214E+10		.202157E+08		.964016E+07		.167321E+08			
2	800	CRUDE PETRO, GAS		.524366E+08	0.	.4083357E+09		.698414E+08		.120036E+11		0.		.271067E+09		.549208E+09	
3	3101	PETRO REFIN, PROD		.966464E+10	0.	.1552788E+08		.100770E+10		.425688E+10		.112227E+10		.551155E+09		.198613E+10	
4	6801	ELECTRIC UTIL		.133947E+11	0.	0.		.426006E+08		.209291E+09		.138852E+09		.465034E+08		.467805E+09	
5	6802	GAS UTILITIES		.504125E+10	0.	0.		.868235E+08		.760751E+09		.153401E+08		0.			
6	100	LIVESTOCK		.191546E+10	0.	-.923450E+09		.179764E+09		.331847E+09		.483690E+07		.113582E+09			
7	200	MISC AG PRODUCTS		.547103E+10	0.	.123633E+10		.113529E+11		.874506E+09		.271067E+09		.980541E+07			
8	300	FOREST LSTK PROD		.925145E+09	0.	.225068E+08		.307140E+09		.136333E+10		0.		.551155E+09			
9	400	FOR, FISH SER		.144016E+09	0.	0.		.165096E+08		.181955E+07		.468543E+07		.546034E+08			
10	500	IRON ORE MINING		.0.		.876780E+08		.187544E+09		.691920E+09		0.		.289143E+07		0.	
11	600	NONFERR MINING		0.		.245995E+09		.870921E+08		.441094E+09		-.566786E+06		.6865110E+08			
12	900	STONE CLAY MIN		.771546E+07	0.	.998371E+08		.339025E+09		.266894E+09		-.405589E+06		-.6865110E+08			
13	1000	CHEM MINERAL MIN		.6736669E+07	0.	0.		.152537E+08		.724200E+08		.287195E+08		.211622E+11			
14	1100	NEW CONSTRUCTION		0.		.904069E+11		0.		0.		.500307E+10		.826190E+08			
15	1200	MAINT, REP CONST		0.		0.		.636075E+07		0.		.180029E+10		.802199E+10			
16	1300	ORDNANCE		.501391E+09		.102737E+09		.329409E+09		.143975E+10		.647476E+08		.475251E+10			
17	1400	FOOD		.778556E+11	0.	.283576E+10		.489212E+10		.515565E+10		.362282E+09		.293364E+10			
18	1500	TOBACCO		.570757E+10	0.	.112537E+09		.114711E+10		.905921E+08		0.		.13418E+07			
19	1600	FABRIC & MILLS		.683740E+09		.6767676E+09		.767483E+09		.736698E+09		.518459E+07		.826190E+08			
20	1700	TEXTILE GOODS		.188574E+10		.4603288E+09		.300761E+09		.512277E+09		.154549E+08		.453480E+07			
21	1800	APPAREL		.258405E+11	0.	.174588E+10		.586303E+09		.400091E+10		.721294E+08		.150571E+09			
22	1900	FAB TEXTILE PROD		.299587E+10	0.	.1288088E+09		.261100E+09		.182333E+09		.424878E+08		.704928E+08			
23	2000	WOOD PRODUCTS		.3761419E+09		.1086628E+10		.134509E+10		.214730E+10		.141220E+08		.313686E+08			
24	2100	WOOD CONTAINERS		0.		.120060E+08		.308807E+07		.243895E+08		.576553E+07		0.		.549900E+08	
25	2200	H'OLD FURNITURE		.567059E+10		.481266E+09		.981024E+08		.353239E+09		0.		.591368E+08			
26	2300	FURN, FIXTURES		.268902E+09		.118772E+09		.654929E+08		.141524E+09		.852513E+08		.523285E+09			
27	2400	PAPER PRODUCTS		.226637E+10	0.	.631151E+09		.143861E+10		.215156E+10		.109982E+09		.584337E+09			
28	2500	PAPERBOARD CONT		.113709E+09	0.	.282255E+09		.667136E+08		.833921E+07		.104197E+08		.512360E+08			
29	2600	PRINTING, PUBL		.542644E+10	0.	.433395E+09		.60249E+09		.249532E+09		.251373E+09		.234328E+10			
30	2700	CHEM PRODUCTS		.453463E+09		.689282E+09		.358452E+10		.194454E+10		.602464E+09		.345859E+09			
31	2800	PLASTICS		0.		0.		.3442288E+09		.119284E+10		.311757E+09		.804696E+06			
32	2900	DRUGS, TOIL PREP		.127162E+11		.116035E+10		.144918E+10		.549362E+09		.123140E+09		.155527E+10			
33	3000	PAINTS		.124114E+09	0.	.142852E+09		.118529E+09		.927729E+08		.492523E+07		.164136E+07			
34	3102	PAVING		0.		.155278E+09		.158715E+07		.307919E+07		0.		0.		0.	
35	3103	ASPHALT		0.		.402427E+09		.184687E+08		.727216E+07		0.		0.		0.	
36	3200	RUBBER PRODUCTS		.445837E+10		.449876E+08		.658039E+09		.104468E+10		.154019E+10		.353691E+09		.363795E+09	
37	3300	LEATHER PRODUCTS		0.		0.		.497164E+08		.116675E+09		.121640E+09		.576681E+06		.847824E+07	
38	3400	FOOTWEAR		.547974E+10	0.	0.		.142928E+09		.194653E+10		.406195E+07		.104555E+07		.384687E+06	
39	3500	GLASS PRODUCTS		.596717E+09	0.	.122672E+09		.158715E+07		.304166E+09		.196881E+08		.1161403E+08		.1166170E+09	
40	3600	STONE CLAY PROD		.60301E+09		.657830E+09		.433955E+09		.762001E+09		.252754E+08		.221760E+08		.227260E+08	



Table 12 (continued)

1-0 Code	COMMODITY	Personal Consumption Expenditures	Gross Private Fixed Investment	Net Inventory Change	Exports		Imports	Federal Government Purchases	State & Local Government Purchases
46 4200	FAB METAL PROD ENGINES, TURBINES FARM MACHINERY	.116630E+10 .143466E+09 .687003E+08	.919873E+09 .124055E+10 .534431E+10	.107087E+10 .334858E+09 .143530E+09	.115093E+10 .138733E+10 .169953E+10	.106390E+10 .297211E+09 .677165E+09	.561925E+09 .415114E+09 .560542E+08	.836250E+08 .994798E+08 .139307E+09	.133103E+07
47 4300	CONST. MINING EQ	0.	.467701E+10	.735792E+09	.301807E+10	.264935E+09	.125235E+09	.125235E+09	.133103E+07
48 4400	MAT HANDLING EQ	0.	.186639E+10	.144256E+09	.596396E+09	.335013E+09	.102395E+09	.102395E+09	.133103E+07
49 4500									
50 4600									
51 4700	METALWORKING EQ	.170859E+09 .442087E+08	.440787E+10 .376046E+10	.416589E+09 .203434E+09	.784309E+09 .175178E+10	.613796E+09 .716543E+09	.130110E+09 .249339E+08	.431564E+08 .202593E+08	
52 4800	SPEC IND MACH	0.	.376046E+10	.342474E+08	.125856E+09 .667448E+09	.160524E+10 .400267E+10	.142935E+09 .182293E+08	.313701E+08 .849559E+08	.313701E+08
53 4900	GEN IND MACH	0.	.376046E+10	.874791E+10	.667448E+09	.400267E+10	.157570E+10	.217036E+09 .13136E+10	.217036E+09
54 5000	MACH SHOP PROD	.335160E+09							
55 5100	OFFC. COMPUT MACH								
56 5200	SERVICE IND MACH	.543759E+09 .558923E+08	.193154E+10 .384632E+10	.571936E+09 .484494E+09	.110405E+10 .152340E+10	.992544E+08 .833027E+09	.175538E+08 .104327E+10	.270785E+09 .145370E+09	
57 5300	ELLEC IND APPARAT	.508029E+10	.128164E+10	.674541E+09 .422661E+10	.180605E+09 .838160E+10	.703253E+09 .5362857E+09	.104327E+10 .853463E+09	.589074E+08 .224362E+08	.589074E+08
58 5400	H' HOLD APPLIANCE	.977233E+09	.141420E+09	.213782E+09 .590445E+10	.132774E+10 .185765E+10	.166554E+09 .428714E+10	.166554E+09 .620291E+10	.559934E+08 .320901E+09	.559934E+08
59 5500	ELEC LIGHT EQ								
60 5600	R-TV COMMUN EQ	.608562E+10							
61 5700	ELECTRONIC COMP	.479468E+09	.243758E+08	.131475E+10 .733158E+09	.236387E+10 .180605E+09	.179133E+10 .484245E+09	.130083E+10 .126183E+09	.425509E+08 .542404E+08	
62 5800	ELECTRICAL EQUIP	.125013E+10	.733158E+09	.422661E+11 .160668E+10	.422661E+10 .119171E+09	.838160E+10 .522501E+10	.127842E+11 .446640E+09	.148721E+10 .892845E+10	.148721E+10
63 5900	MOTOR VEH & EQ	.291064E+11	.214743E+11	.119171E+09 .469836E+10	.160668E+10 .539667E+10	.597406E+09	.185765E+10 .829552E+09	.691788E+07 .216148E+10	.691788E+07
64 6000	AIRCRAFT & PARTS	.235480E+09							
65 6100	TRANSPORT EQUIP	.403793E+10							
66 6200	PROF SCIENT SUPP	.959419E+09	.294060E+10	.567487E+09 .675956E+09	.168088E+10 .139409E+10	.824038E+09 .131026E+10	.701390E+09 .470510E+09	.341437E+09 .539393E+09	
67 6300	OPTICAL SUPPLIES	.193886E+10	.331382E+10	.847331E+09 .392434E+09	.137192E+10 .921882E+09	.1260819E+10 .921272E+09	.456610E+08 .144607E+09	.645246E+09 .193336E+09	.645246E+09
68 6400	MISC MANUFACT	.789131E+10							
69 6501	RAILROAD	.282359E+10	.514248E+09	0.	.671273E+06	0.	.142013E+08	.868276E+09	
70 6502	LOCAL TRANSPORT	.4336354E+10							
71 6503	MOTOR FGT TRANSP	.761978E+10	.884707E+09	.377712E+09 .510468E+08	.719533E+09 .152572E+10	.0. 159123E+09 .841793E+09	.520492E+09 .238319E+09	.860731E+09 .719539E+09	
72 6604	WATER TRANSPORT	.120033E+10	.907252E+08	.139545E+08 .997001E+08	.139545E+08 .998499E+07	.9583362E+09 .406104E+08	.318052E+09 .502193E+07	.399943E+09 .132618E+08	.399943E+09
73 6605	AIR TRANSPORT	.639578E+10							
74 6606	PIPE LINE TRANSP	.297193E+09	0.						
75 6607	TRANSP SERVICES	.169466E+09	.169466E+09	0.	.132263E+09	0.	0.	0.	
76 6600	COMMUNICATIONS	.191285E+11	.312802E+10	0.	.818564E+09	0.	.439890E+09	.192972E+10	
77 6700	R-TV BROADCAST	0.	0.	0.	0.	0.	0.	0.	
78 6803	WATER, SANIT SER	.338292E+10	0.						
79 6900	BUSINESS SERVICE	.201888E+12	.122524E+11	.199853E+10	.277898E+08	.375044E+10	.162692E+08	.118025E+09	.118025E+09
80 7000	WHOLE, RETAIL TR	.438156E+11	0.	0.	.316501E+09	.316501E+09	.357760E+09	.309759E+10	.309759E+10
81 7100	REAL ESTATE	.141229E+12	.788366E+10	0.	.285854E+10	0.	.358853E+09	.227557E+10	
82 7200	HOTELS, PERS SER	.182815E+09	0.	0.	.533142E+07	0.	.279399E+09	.719839E+09	
83 7300	BUSINESS SERVICE	0.	0.	0.	.231044E+10	0.	.152195E+10	.587481E+10	
84 7500	AUTO REPAIR	.165324E+11	0.	0.	0.	0.	.372801E+08	.500730E+09	
85 7600	AMUSEMENTS	.975707E+10	0.	.132164E+09	.396498E+09	0.	.124487E+08	.679564E+09	
86 7700	MED, EDUC SER	.845371E+11	0.	0.	.485871E+08	0.	.166518E+10	.101629E+11	
87 7800	FED GOVT ENTERP	.221331E+10	0.	0.	.160480E+09	0.	.249875E+09	.732976E+09	
88 7900	ST, LOC GOVT ENT	.215929E+10	0.	0.	0.	0.	.642632E+07	.591296E+08	



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APPENDIX A  
NOTES TO TABLE A1

- (1) 049XX is "Agriculture, Forestry and Fishery, N.S.S.", an aggregate Sector containing all the unaccounted-for residues in Section 6, 7, 8, 9. The contents of 049XX must be allocated to Sectors 6-9. This is accomplished by assigning portions of 049XX based on Sector GCO.
- (2) 129XX is "Construction, N.S.S.", a residue Sector for all construction. It is allocated to Sectors 14 and 15 based on Sector GDO.
- (3) 779XX is "Commercial Industries." This is allocated to Wholesale and Retail trade (79 or 69.00), Finance and Insurance (80 or 70.00).

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APPENDIX A - Table A1. CORRESPONDENCE OF 88 ORDER ERG AND BEA SECTORS  
TO SIC AND NATIONAL ENERGY ACCOUNT SECTORS

88-Order Sector CAC	Includes These BEA 357-Order Sectors BEA	Description	SIC Codes	Is Equivalent to the <u>Sum of</u> these Jack Faucett I-O Codes
1. 7.00		Coal Mining	11,12	07000, 07010 07020, part 109xx@
2. 8.00		Crude Petroleum and Natural Gas	1311, 1321	08000, 08001 08002, 08003 08008, 109xx
3. 31.01		Petroleum Refining and Related Products	2911, 299	31011, 31012
4. 68.01		Electric Utilities	491, pt. 493 pt. 9149, 9249 9349*	68900, 68901, 68903 68910, 68911, 68912 68913, 68920, 68921 68922, 68923, 68930, 68931, 68932 68933, 68941, 68942, 68943, 689xx
5. 68.02		Gas Utilities	492, pt. 493	68020, 68021, 68022
6. 1.00	1.01, 1.02, 1.03	Livestock and Livestock Products	0132, 0133, 0139, pts. 014, 02, 0193, -820	01000, part 049xx**
7. 2.00	2.01, 2.02, 2.03, 2.04, 2.05, 2.06, 2.07	Other Agricultural Products	0112, 0113, 0119, pt. 014, 0122, 0123, 02	02000, part 049xx**
8. 3.00		Forestry and Fishery Products	074, 081, 082, 084, 086, 091	03000, part 049xx**
9. 4.00		Agricultural, forestry, and fishery services	071, 0723, 073, pt. 0729, 085, 098	04000, part 049xx**
10. 5.00		Iron and ferroalloy Ores Mining	1011, 106	05000, part 109xx@
11. 6.00	6.01, 6.02	Nonferrous metal ores mining	102, 103, 104, 105, 108, pt.*109	06001, 06002 part 109xx@
12. 9.00		Stone and Clay Mining and quarrying	141, 142, 144, 145, 148, 149	09000, part 109xx@
13. 10.00		Chemicals and Fertilizer	147	10000, part 109xx@
14. 11.00	11.01, 11.02, 11.03, 11.04 11.05	New Construction	pt. 13, pt. 15 pt. 16, pt. 17 pt. 6561	11000, 11001, 11002, part 129xx#

\*1967 Codes Only

\*\*See Note 1

#See Note 2

@See note 3



CAC	88-Order Sector BEA	Includes These BEA 357-Order Sectors	Description	SIC Codes	Is Equivalent to <u>the Sum of these</u> Jack Faucett I-O Codes
15.	12.00	12.01, 12.02	Maintenance and Repair Construction	pH 5, pt. 16, pt. 17	12000 Part 129xx**
16.	13.00	13.01, 13.02 13.03, 13.04 13.05, 13.06 13.07	Ordinance and Accessories		13000
17.	14.00	14.01, 14.32, Consec.	Food and Kindred Products	20	14000
18.	15.00	15.01, 15.02	Tobacco Manufactures	21	15000
19.	16.00	16.01, 16.02, 16.03, 16.04	Broad and Narrow Fabrics, Yarn & Thread Mills	2211, 2221, 2231, 2261, 2262, 2241, 2269, 2281,	16000
20.	17.00	17.01, 17.10 Consec.	Misc. Textile Goods and Floor Coverings	227, 229	17000
21.	18.00	18.01, 18.02 18.03, 1804	Apparel	225, 23 exc. 329, 3992	18000
22.	19.00	19.01, 19.02, 19.03	Misc. Fabricated Textile	230	19000
23.	20.00	20.01, 20.09 Consec.	Lumber and Wood Products Except Containers	24 exc. 244	20000
24.	21.00		Wooden Containers	244	21000
25.	22.0	22.01, 22.02, 22.03, 22.04	Household Furniture	2511, 2512, 2514, 2515, 2519	22000
26.	23.0	23.01, 23.07, Consec.	Other Furniture and Fixtures	252, 253, 254, 259	23000
27.	24.00	24.01, 24.07	Paper and Allied Products Except Containers and Boxes	26 exc. 265	24020, 24990
28.	25.00		Paperboard Containers and Boxes	265	25000
29.	26.00	26.01, 26.08 Consec.	Printing and Publishing	27	26000

\*\* See Note 2



CAC	88 -Order Sector BEA	Includes These BEA 357-Order Sectors	Description	SIC Codes	Is Equivalent to the <u>Sum</u> of these Jack Faucett I-O Codes
30.	27.00	27.01, 27.02 27.03, 27.04	Chemicals and Selected Chemical Products	281 exc. 28195, 2871, 2872, 2879, 289	27010, 27011, 27012 27020, 27030, 27040
31.	28.00	28.01, 28.02, 28.03, 28.04	Plastics and Synthetic Materials	282	28010, 28020, 28990
32.	29.00	29.01, 29.02, 29.03	Drugs, Cleaning & Toilet Preparations	283,284	29000
33.	30.00		Paints and Allied Products	2851	30000
34.	31.02		Paving Mixtures & Blocks	2951	Allocation Fraction 31990 <sup>@@</sup> <u>.498</u>
35.	31.03		Asphalt Felts & Coatings	2952	.502
36.	32.00	32.01, 32.02, 32.03	Rubber and Misc. Plastic Products	30	32000
37.	33.00		Leather Tanning and Industrial Leather Products	3111, 3121	33000
38.	34.00	34.01, 34.02, 34.03	Footwear and Other Leather Products	31 exc. 3111, 3121	34000
39.	35.00	35.01, 35.02	Glass and Glass Products	321, 322	35000
40.	36.00	36.01, 36.22	Stone and Clay Products	32 except. 321, 322	36010, 36900
41.	37.00	37.01, 37.02, 37.03, 37.04	Primary Iron and Steel Manufacturing	331, 332, 3391, 3399	37000, 37011, 37012, 37990
42.	38.00	38.01, 38.14 Consec.	Primary Nonferrous Metals Manufacturing	333, 334, 335, 336, 3392, 28195	38000, 38040 38990

<sup>@@</sup> See Note 4.



CAC	88-Order Sector BEA	Includes These BEA 357-Order Sectors	Description	SIC Codes	Is Equivalent to the <u>sum of</u> these Jack Faucett I-O Codes
43.	39.00	39.01, 39.02	Metal Containers	341, 3491	39000
44.	40.00	41.01, 40.09 Consec.	Heating, Plumbing, and Fabricated Structural Metal Products	343, 344	40000
45.	41.00	41.01, 41.02	Screw Machine Products	341, 3461	41000
46.	42.00	42.01-42.11 Consec.	Other Fabricated Metal Products	342, 347, 349 exc. 3491	42000
47.	43.00	43.01, 43.02	Engines and Turbines	351	43000
48.	44.00		Farm Machinery	3522	44000
49.	45.00	45.01, 45.02, 45.03	Construction, Mining, Oil Field Machinery and Equipment	3531, 3532, 3533	45000
50.	46.00	46.01, 46.02, 46.03, 46.04	Materials Handling Machine- ry and Equipment	3534, 3535, 3536, 3537	46000
51.	49.00	47.01, 47.02, 47.03, 4704	Metal Working Machinery and Equipment	354	47000
52.	48.00	48.01-48.06 Consec.	Special Industry Machinery and Equipment	355	48000
53.	49.00		General Industrial Machinery and Equipment	356	49000
54.	50.00		Machine Shop Products	359	50000
55.	51.00		Office, Computing and Accounting Machines	357	51000



88-Order Sector CAC	Includes These BEA 357-Order Sectors BEA	Description	SIC Codes	Is Equivalent to <u>the Sum of</u> these Jack Faucett I-O Codes
56..	52.00	Service Industry Machines	358	52000
57..	53.00	Electric Transmission and Distribution Equipment and Electrical Industrial Apparatus	361, 362	53000
58..	54.00	Household Appliances	363	54000
59..	55.00	Electric Light and Wiring Equipment	364	55000
60..	56.00	Radio, Television, and Communication Equipment	365, 366	56000
61..	57.00	Electronic Components and Accessories	367	57000
62..	58.00	Misc. Electrical Machinery, Equipment and Supplies	369	58000
63..	59.00	Motor Vehicles and Equipment	371	59000
64..	60.00	Aircraft and Parts	372	60000
65..	61.00	Other Transportation Equipment	373, 374, 375, 379	61000
66..	62.00	Professional, Scientific, and Controlling Instruments and supplies	381, 382, 384, 387	62000
67..	63.00	Optical, Ophthalmic and Photographic Equipment and Supplies	3831, 3851, 3861	63000



88-Order Sector CAC	Includes These BEA 357-Order Sectors BEA	Description	SIC Codes	Is Equivalent to the sum of these Jack Faucett I-O Codes
68.. 64.00		Misc. Manufacturing	39	64000
69.. 65.01		Railroads and Related Services	40, 474	65010 part 65000 *#
70.. 65.02		Local, Suburban, and Inter-urban Highway Passenger Transportation	41	65020 part 65000 *#
71.. 65.03		Motor Freight Transportation, and Warehousing	42, 473	65030 part 65000 *#
72.. 65.04		Water Transportation	44	65040 part 65000 *#
73.. 65.05		Air Transportation	45	65050 part 65000 *#
74.. 65.06		Pipeline Transportation	46	65060 part 65000 *#
75.. 65.07		Transportation Services	47 except 473, 474	65070 part 65000 *#
76.. 66.00		Communications except Radio and Television Broadcasting	48 except 483	66000
77.. 67.00		Radio and Television Broadcasting	483	67000
78.. 68.03		Water and Sanitary Services	494, 495, 496, 497, pt. 493	68030
79.. 69.00		Wholesale and Retail Trade	50, 52, 53, 54, 55, 56, 57, 58, 59, 73, 517	69000, 69010 69012, 69020 69021, 69024 part 779XX <sup>2</sup>

@ See Note (4)  
\*# See Note (3)



88-Order Sector CAC	Includes These BEA 357-Order Sectors BEA	Description	SIC Codes	Is Equivalent to the Sum of these Jack Faucett I-O Codes
80. 70.00		Finance and Insurance	60, 61, 62, 63, 64, 67	70000, part 779xx
81. 71.00		Real Estate and Rental	65 except pt. 6561, 66	71000 part 779xx *#
82. 72.00		Hotels and Lodging Places, Personal and Repair Services except Automobile Repair	70, 72 (except 723, 724), 76, (except 7694, 7692, pt. 7699) 723, 724	72000 part 779xx *#
83. 73.00		Business Services	73 (except 731, 7396), 7694, 7692, pt. 7699 731, 81, 89 (except 8921)	73000 part 779xx *#
84. 75.00		Automobile Repair and Services	75	75000 part 779xx *#
85. 76.00		Amusements	78, 79	76000 part 779xx *#
86. 77.00		Medical, Educational Services and Non-Profit Organization	80, 82, 8921, 0722, 84, 86 (excl.pt.8099)	None part 779xx *#
87. 78.00		Federal Government Enterprises	--	78009, 78030
88. 79.00		State and Local Government Enterprises	--	79009

\*# See Note (4)



APPENDIX A TABLE A2

## NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY

PRIVATE ENERGY PRODUCTS	A. SIC SECTOR	B. NEA PROD. CODE	C. 90-ORDER BEA SECTOR	D. ACTUAL PRODUC- INC SECTORS, 1971	E. FINAL CAC DET SECTOR	F. NEA "PRIC PROD. SECTOR"	G. XFER ELEMENT(S) REQD. FOR NPG. COMS. •	H. MATERIAL INPUT ADJUSTMENT TERM•	I. CONVENTION FACTOR ADJUSTMENT••
Crude oil (including lease condensate)	13 <sup>1</sup>	11000	8.00 <sup>1</sup>	8.00	8.00	0.00	0.00	0.00	-
Natural gas and similar products		12000							
Natural gas - wet	13 <sup>1</sup>	12100	8.00 <sup>1</sup>	8.00	8.00	0.00	0.0002	0.0	0.0004
Natural gas - dry	13 <sup>1</sup>	12200	8.00 <sup>1</sup>	8.00	8.02	0.00	0.0003	TD to (2,68020)	
Manufactured gases		12300							
Still gas	2911	12310	31.01	31.01	31.01	31.01	TD to (2,31011)		•90604
Coke-oven gas	1925	12320	68.02	37.01	68.02	68.02	TD to (2,68020)		
Other manufactured gases	1925	12370	68.02	68.02	68.02	68.02	TD to (2,68020)		
Manufactured gases, n.e.k.	1925	12390	68.02	68.02	68.02	68.02	TD to (2,68020)		
Mixed Gas	1925	12400	68.02	68.02	68.02	68.02	TD to (2,68020)		
Natural or similar gas, n.e.k.	13 <sup>1</sup>	12900	8.00 <sup>1</sup>	8.00	8.02	8.02	TD to (2,68020)		•94510
Coal	11, 12	13000	7.00	7.00	7.00	7.00	7.00	7.00	
Anthracite		13100							
Bituminous coal and lignite		13200							
Bituminous coal		13210							
Lignite		13220							
Bituminous and lignite, n.e.k.		13290							
Coal, n.e.k.		13900	N.A. <sup>2</sup>	N.A.	N.A.	N.A.			
Nuclear ores									
Uranium ore									
Thorium ore		14100							
Other nuclear ores, n.e.c.		14200							
Water power		14900							
Geothermal power		15000							
Solar power		16000							
Wood for fuel		17000							
Other primary energy products, n.e.c.		18000							
		19000							

Refer Steve Martin 3/16/78. See entry #45 in DET documentation files.

•RT = Row Total.

••One unless noted.



APPENDIX A TABLE A2  
NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY (CONTINUED)

SIC SECTOR 1972	NEA PROD. CODE	C.	D. 90-ORDER PEA SECTOR	E. ACTUAL PRODUC- ING SECTORS, 1971	F. FINAL CAC DET SECTOR	G. NEA "PRI PROD. SECTOR"	H. MATERIAL INPUT ADJUSTMENT TERM**	I. CONVERSION FACTOR ADJUSTMENT***
<b>COT-EXPTD HYDROCARBONS</b>								
Light hydrocarbon gases (aliphatics) <sup>a</sup>	20000							
Ethane and ethylene	1321 3,4	21000	31.01 3,4			31.01		
Ethane	1321 3,4	21100	31.01 3,4			31.01		
Ethane and ethylene, n.s.c.	1321 3,4,5	21800	31.01 3,4,5			31.01		
Propanes and butanes <sup>b</sup>	1321 3	23000	31.01 3,4					
Propane and propylene		23100						
Propane		23110						
Propane and propylene, n.s.s		23180						
Butanes and butylene	23200							
Normal butane	23210							
Isobutane	23220							
Other butanes, n.e.c.	23230							
Butanes and butylene, n.s.s	23280							
Butane, n.s.k.	23290							
Propane-butane mixtures	23300							
Other liquefied gas mixtures	23400							
Liquefied gases, not including propylene and butylene, n.s.k.		23700						
Liquefied gases, including propylene and butylene, n.s.k.23800		30000	31.01 <sup>5</sup>					
Gasoline and naphthas	2911 5							
Gasoline	31000							
Motor gasoline	31100							
Aviation gasoline	31200							
Gasoline, n.s.k.	31900							
Special naphthas <sup>6</sup>	33000							
Special naphthas, except naphtha 400	33100							
Naphtha 400	33200							
Special naphthas, n.s.k.	33900							

♦RT = Row Total

\*\*One unless noted.



APPENDIX A TABLE A2  
NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY (CONTINUED)

A. 1972 SIC SECTOR	B. NEA PROD. CODE	C. 90-ORDER BEA SECTOR	D. ACTUAL PRODUC- ING SECTOR, 1971	E. FINAL CAC DET SECTOR	F. NEA "PRI PROD. SECTOR" "XFER ELEMENT(S) REQD. FOR INRG. CCNS."	G. NEA "PRI PROD. SECTOR" "XFER ELEMENT(S) REQD. FOR INRG. CCNS."	H. MATERIAL INPUT ADJUSTMENT TERM**	I. CONVERSION FACTOR ADJUSTMENT**
Isopentane <sup>5</sup>								
Saphtha-type jet fuel								
Other neptanes and products in the gasoline range, n.e.c.	1321 <sup>4</sup>	38000	31.01	31.01	08003	RT to (2,31011)	0.0	
Natural gasoline		38100	8.00 <sup>4</sup>	8.00	08003			
Plant condensate		38200	8.00 <sup>4</sup>	8.00	08003			
Other natural gas liquids, n.e.c.	2911 <sup>5</sup>	38700	31.01 <sup>4</sup>	8.00	08003	RT to (2,31011)		
Fuel oils		40000	31.01	31.01	31.01			
Distillate fuel oils		41000			31.01			
Kerosine and no. 1 fuel oil		41100						
Kerosine used for jet fuel	2911 <sup>5</sup>	41110						
Absorption oil		41130	31.01 <sup>5</sup>	31.01	31.01			
Kerosine for other uses		41150						
Kerosine, n.s.k.		41180						
No. 1 fuel oil, n.s.k.		41190						
No. 2 fuel oil		41200						
No. 3 fuel oil		41300						
No. 4 fuel oil		41400						
Distillate fuel oils, n.s.k.		41900						
Distillate used for heating		41910						
Distillate used for diesel fuel		41920						
Distillate for unspecified use		41980						
Distillate fuel oil, n.e.c.		41990						
Residual fuel oils		42000						
No. 5 fuel oil		42200						
No. 6 fuel oil		42600						
Other residual fuel oils, n.s.k.		42900						
Fuel oil, n.s.k.		48000						

\*RT = Row Total.

\*\*One unless noted.



APPENDIX A TABLE A2  
NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY (CONTINUED)

A. SIC SECTOR	B. 1972 NEA PROD. CODE	C. 90-ORDER BEA SECTOR	D. ACTUAL PRODUC- TING SECTOR, 1971	E. FINAL CAC DET SECTOR	F. NEA "PRI PROD. SECTOR"	G. XFER ELEMENT(S) REQD. FOR NRG. CONS. *	H. MATERIAL INPUT ADJUST. TERM**	I. CONVER- SION FACTOR ADJUSTMENT**
Unsaturated light hydrocarbons				37011	zero			
Unrefined aromatics	2865	51000	27.00					
Crude light oil (from coal)		51100		37.01				
Intermediate light oil (from coal)		51200		37.01				
Other unrefined aromatics, n.e.c.	28	51100		37.01				
Refined aromatics	28	53000	27.00					.74605
Benzene		53100			93.3%	31.01	31.011	
Toluene		53200			6.7%	37.01	31.01	
Xylene		53300			98.5%	31.01	31.011	
Methylbenzene		53400			1.5%	37.01	31.01	
Sodium phenolate or carbolate		53500			99.5%	31.01	31.011	
Other refined aromatics, n.e.c.		53900			0.5%	37.01	31.01	
Gases		55000			58.3%	37.01	31.01	
Ethylene		55100			37.01	0.00	?	
Propylene		55200			96.9%	27.00	0.00	
Butylene		55300			3.1%	37.01	0.00	
Other petroleum products		60000						
Lubricating oils, greases, and related products	2911	61000	31.01					
Lubricants		61100						
Lubricating oil		61110						
Greases		61120						
Lubricants, n.e.k.		61190						
Insulating oil		29115						
Hydraulic fluid		61200			31.01 <sup>5</sup>			
Spray oil		61300			31.01			
Other lubricants, grease, and allied products, n.e.c.		61400			31.01 <sup>5</sup>			
Purposeful &itch: half of this is actually from coal but we neglect it.		29115			61900	31.01 <sup>5</sup>		

\*RT = Row Total.  
\*\*One unless noted.



APPENDIX A TABLE A2  
NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY (CONTINUED)

A.	B.	C.	D.	E.	F.	G.	H.
1972 SIC SECTOR	NEA PROD. CODE	90-ORDER BEA SECTOR	ACTUAL PRODUC- TING SECTOR, 1971	FINAL CAC DET SECTOR	NEA "PRI" PROD. SECTOR*	NEA ELEMENT(S) RESD. FOR NRG. COSTS*	MATERIAL INPUT ADJUSTMENT ITEM**
<b>NUCLEAR ENERGY PRODUCTS</b>							
Milled uranium							
Uranium hexafluoride	81000						
Enriched uranium	82000						
Plutonium	83000						
Fabricated nuclear energy products	84000						
Fabricated uranium	85000						
Fabricated plutonium	85100						
Fabricated thorium	85200						
Spent nuclear energy products	85300						
Nuclear wastes	86000						
ELECTRICITY							
Electricity	88000						
Electricity	91000			66.01	Various	66.01	
Electricity	92000			66.01	Various	66.01	
Steam							
Steam	492						
Steam	92000						
UNSPECIFIED FUELS							
Hydrogen and other hydrocarbons, n.e.c.							
Unspecified fuel	98000						
Unspecified fuel	99000						

\*RT = Row Total.  
\*\*One unless noted



APPENDIX A TABLE A2  
NATIONAL ENERGY ACCOUNTS APPENDIX 1 - ENERGY PRODUCTS TAXONOMY (CONTINUED)

A.		B.		C.		D.		E.		F.		G.		H.	
1972 SIC SECTOR	NEA PROD. CODE	90-ORDER SECTOR	NEA SECTOR	ACTUAL PRODUC- ING SECTOR, 1971	31.01	FINAL CAC DET SECTOR	NEA "PRI PROD. SECTOR"	XPER ELEMENT(S) REQD. FOR MFG. COSTS*	NEA "PRI PROD. SECTOR"	FINAL CAC DET SECTOR	XPER ELEMENT(S) REQD. FOR MFG. COSTS*	MATERIAL INPUT ADJUSTMENT TERM**	CONVERSION FACTOR ADJUST- MENT***		
Medicinal oil	2911 <sup>5</sup>	62000	31.01			31.01		?	?						
Petroleum	2911	63000	31.01					?	?						
Waxes	2911 <sup>2</sup>	64000	31.01	6					31012						
Asphalt and road oil	295 <sup>3</sup>	65000	31.02,03 <sup>2</sup>	—											
Asphalt and road tar		65100													
Asphalt		65110					31.02		31.01 <sup>4</sup>	31012					
Road tar		65120					27.01		31.01 <sup>4</sup>	31012					
Road oil		65200					31.01		31.01 <sup>4</sup>	31012					
Carbon black	2895 <sup>2</sup>	66000	2	N.A.			—		—						
Unfinished oils	28 2,5	67000	N.A. 2,5						31.01	31012					
Petroleum products, n.s.k. used for															
Jet fuel	2911 <sup>5</sup>	68000	31.01 <sup>5</sup>				none		31.01	31012					
Other finished petroleum products, n.e.c.	2911 <sup>5</sup>	69000	31.05 <sup>5</sup>				none		31.01	31012					
Coal derivatives, n.e.c.		70000													
Coke and breeze		71000													
Coke		71100													
Coal coke	3312 <sup>2</sup>	71110	37.01 <sup>2</sup>				37.01		7.00	?	?				
Petroleum coke	2911	71120	31.01				31.01		31.01	31012					
Breeze	2911	71200	31.01				37.01		31.01	37011	Add and subtract				
Coke and breeze, n.s.k.	2911	71900	31.01				none		7.00	37011	Sub. To (1,37011)				
Coal tar	2865 <sup>2</sup>	72000	37.01 <sup>2</sup>				37.01	63.9%	27.01	None	Sub. only				
Pitch (from coal tar)		73000						36.1%	37.01	37011					
Coal tar derivatives, n.e.c.		74000						none	none	None	?				
Coal light oil derivatives, n.e.c.		75000						none	none	None	?				
Ammonia products	2873, 2884 <sup>2</sup>	76000	27.01 <sup>2</sup>					37.01	None	None	?				
Fuel briquettes	2999	77000	31.01					31.01	31.01	31.01	?				

\*RT = Row Total.

\*\*One unless noted.



APPENDIX A--TABLE A2

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CROSS REFERENCE OF ENERGY PRODUCTS BY SIC,  
NATIONAL ENERGY ACCOUNTS, AND BEA SECTOR  
CLASSIFICATION

Adapted from Appendix 1 of the National  
Energy Accounts.

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This appendix lists all products considered to be primary forms of energy in the United States in 1971. The first column (column A) shows the 1972 SIC classification of the energy product. Column B shows the sector designation used in the National Energy Accounts, an entirely independent numbering system shown here for identification purposes only. The third column (C) shows the correct 90-order BEA sector the product ends up in after BEA has performed all relevant transfers and adjustments. This would be the sector classification we'd use if we wanted to adhere strictly to BEA allocation conventions.

We employ the convention of assigning an energy product to the primary energy form\* from which the product was originally produced. For example, coal coke is assigned to the coal sector and petroleum coke is assigned to 31.01 refined petroleum. In contrast, BEA classifies coal coke as an output of 37.01. Column D lists the BEA sectors which actually produced the product in 1971 (according to Table D, Volume V of the Accounts). Column E shows the final classification we use in our 1971 DET matrix.

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\*The five primary energy sectors are BEA 7.00, 8.00, 31.01, 68.01, and 68.02.



NOTES TO THIS APPENDIX:

<sup>1</sup>All products classified in 8.00 (Crude Petroleum and Natural Gas) are sold either to 31.01, 68.02, or 28.00. Sector 68.02 then sells what was originally the output of 8.00 to all other sectors. Thus 68.02 is not listed as the primary producer of any energy form. Note that in this case sector 68.02's self-use of natural gas is equal to its purchases of energy from 8.00 less its total output (since it consumes no crude oil).

<sup>2</sup>Not one of five energy sectors considered as primary energy sources in this report (BEA 7.00, 8.00, 31.01, 68.01, 68.02). Steam is transferred out of 68.02.

<sup>3</sup>The amount of these products used as feedstocks can be determined in several ways. First, certain energy forms are useful only as feedstocks, i.e., Toluene. Secondly, NEA use classification 3000 (and subclassifications) are specifically feedstock uses of energy. Note this does not include energy converted to other useful energy forms (e.g., coke conversion). Feedstock use of energy can be read from the conversion account (Table E) or by juggling the totals in Tables G and H.

<sup>4</sup>All contents of SIC 1321 (Natural Gas Liquids) except natural gasoline and plant condensate are transferred to BEA 31.01 rather than staying in BEA 8.00. (BEA, 6/6/77.) This convention is followed here.

<sup>5</sup>Contains a product not specifically classified into an SIC sector. Product has been assigned to this sector because the sector contains similar products.

<sup>6</sup>These products are in 31.01 only if they are produced in petroleum refineries. This is assumed for all purposes in this table.

<sup>7</sup>These products are in categories shown only if they are NOT produced in petroleum refineries, which is assumed throughout.



National Energy Account Notes  
(from the original source)

<sup>a</sup>Ethylene, propylene, and butylene are listed for separate reporting in the olefins category (55000), under unsaturated light hydrocarbons. However, production of these products is presently reported in conjunction with ethane, propane, and butane, and categories are therefore provided for these olefins under light hydrocarbon gases (20000). These duplicate categories are to be dropped as separate data on ethylene, propylene, and butylene become available.

<sup>b</sup>Formerly called liquified gases (liquified refinery gases, when produced in petroleum refineries; liquified petroleum gases, when produced in natural gas processing plants).

<sup>c</sup>Most coal tar and light oil derivatives are reported in the principal hydrocarbon series, especially in the aromatics categories (51000, 53000).



## APPENDIX B

### BTU CONVERSION FACTORS

The sources from which the Btu conversion factors of the individual energy products were obtained are listed at the end of table A-1. The Btu conversion factors for the aggregate energy products, e.g., coal, natural gas liquids, etc. were obtained through a weighted average method. The particular method employed for each aggregate product is also given in the accompanying table. The table presents the Btu conversion factors for 1973 and 1974. The Btu conversion factors for all of the years are available in the computer files.

The following special considerations were made:

- Crude oil is one of the few aggregate products not treated on a weighted average basis. This is because of the large number of components involved and also because of the different physical state of these components. The Bureau of Mines data on crude oil were accepted as the best available year-by-year approximations of average Btu conversion factors. Unfinished oils were also assumed to have the same Btu conversion factors because their average composition probably resembles that of crude oil.
- Two different heat conversion series were obtained for bituminous coal because there is a significant difference in heat content between metallurgical coal and coal used for other purposes. These were then averaged to generate a heat factor for bituminous coal, n.s.k.
- In several cases where a product definition encompasses negligible amounts of several unnamed products, development of an independent heat conversion rate is impossible. Such situations were overcome by assigning the factors of the next level of aggregated product (of which the



product in question is a component) to the catch-all. For example, the category Other Liquefied Gas Mixtures (23400) has been assigned the same Btu conversion factor as Propanes and Butanes (23000).

Sodium Phenolate/Carbolate is a marginal product at best and was treated by deriving a simple average of the heat factors of its related products—(naphthalene and pitch of tar). No other information could be obtained on this substance and thus averaging was the only alternative left.



TABLE B-1 - BTU CONVERSION FACTORS

Product Code	Energy Product	Conversion Factor			
		Units	1973	1974	Source Code*
11000	Crude oil (including lease condensate)	Btu/bbl	5,800,000	5,800,000	1
12000	Natural gas and similar products	Btu/cu.ft.	1076.95	1079.88	3M
12100	Natural gas - wet	Btu/cu.ft.	1103.6	1107.3	3G
12200	Natural gas - dry	Btu/cu.ft.	1021	1024	7
12300	Manufactured gases	Btu/cu.ft.	540	540	7
12310	Still gas	Btu/cu.ft.	952	952	7
12320	Coke-oven gas	Btu/cu.ft.	550	550	7
12370	Other manufactured gases	Btu/cu.ft.	540	540	7
12390	Manufactured gases, n.s.k.	Btu/cu.ft.	540	540	7
12400	Mixed gas	Btu/cu.ft.	992	992	3P
12900	Natural or similar gas, n.s.k.	Btu/cu.ft.	1076.95	1079.95	3M
13000	Coal	Btu/s.ton	23,500,000	23,500,000	3L
13100	Anthracite	Btu/s.ton	25,400,000	25,400,000	1,13
13200	Bituminous coal and lignite	Btu/s.ton	23,500,000	23,500,000	3I
13210	Bituminous coal	Btu/s.ton	23,700,000	23,700,000	3J
13210- (function 2600)	Bituminous coal (export and metallurgical)	Btu/s.ton	26,800,000	26,800,000	15
13210- (function 6000)					
13210- (function 2400)	Bituminous coal (other purposes)	Btu/s.ton	22,700,000	22,700,000	14
13210- (functions 100, 1310)					
13220	Lignite	Btu/s.ton	13,340,562	13,340,562	16
13290	Bituminous and lignite, n.s.k.	Btu/s.ton	23,500,000	23,500,000	3I
13900	Coal, n.s.k.	Btu/s.ton	23,500,000	23,500,000	3L
15000	Water power	Btu/kWh	10,429	10,481	17
21100	Ethane	Btu/bbl	3,082,380	3,082,380	13
21800	Ethane and ethylene, n.s.s.	Btu/bbl	3,082,380	3,082,380	13
23000	Propanes and butanes	Btu/bbl	4,012,577	4,014,239	3C
23110	Propane	Btu/bbl	3,847,806	3,847,806	6
23150	Propane and propylene, n.s.s.	Btu/bbl	3,847,806	3,847,806	6
23210	Normal butane	Btu/bbl	4,358,610	4,358,610	6
23220	Isobutane	Btu/bbl	4,189,233	4,189,233	6
23330	Other butanes, n.e.c.	Btu/bbl	4,299,110	4,299,305	3B

\*Note: Data sources are noted at end of table.



TABLE B-1. - BTU CONVERSION FACTORS (CONTINUED)

Product Code	Energy Product	Conversion Factor			
		Units	1973	1974	Source Code
23280	Butanes and butylene, n.s.s.	Btu/bbl	4,299,115	4,299,218	3B
23290	Butane, n.s.k.	Btu/bbl	4,299,115	4,299,218	3B
23300	Propane-butane mixtures	Btu/bbl	4,012,577	4,014,239	3C
23400	Other liquefied gas mixtures	Btu/bbl	4,036,967	4,036,967	3C
23700	Liquefied gases, not including propylene and butylene, n.s.k.	Btu/bbl	4,012,577	4,014,239	3C
23800	Liquefied gases, including propylene and butylene, n.s.k.	Btu/bbl	4,012,577	4,014,239	3C
31000	Gasoline	Btu/bol	5,248,000	5,248,000	1,13
31100	Motor gasoline	Btu/bol	5,248,000	5,248,000	1,13
31200	Aviation gasoline	Btu/bol	5,248,000	5,248,000	1,13
31900	Gasoline, n.s.k.	Btu/bol	5,248,000	5,248,000	1,13
33000	Special naphthas	Btu/bol	5,248,000	5,248,000	1,13
33100	Special naphthas, except naphtha 400	Btu/bol	5,248,000	5,248,000	1,13
33200	Naphtha 400	Btu/bbl	5,248,000	5,248,000	1,13
33900	Special naphtha, n.s.k.	Btu/bol	5,248,000	5,248,000	1,13
34000	Isopentane	Btu/bbl	4,556,034	4,556,034	8
35000	Naphtha-type jet fuel	Btu/bbl	5,355,000	5,355,000	1,13
38100	Natural gasoline	Btu/bbl	4,620,000	4,620,000	1,13
38200	Plant condensate	Btu/bbl	4,556,034	4,556,034	8
38700	Other natural gas liquids, n.e.c.	Btu/bol	4,611,503	4,611,967	3E
40000	Fuel oils	Btu/bbl	5,944,767	5,958,289	3D
41110	Kerosine used jet fuel	Btu/bbl	5,670,000	5,670,000	1,13
41130	Absorption oil	Btu/bbl	6,065,000	6,065,000	2
41150	Kerosine used for jet fuel	Btu/bbl	5,670,000	5,670,000	1,13
41180	Kerosine, n.s.k.	Btu/bbl	5,670,000	5,670,000	1,13
41900	Distillate fuel oil, n.s.k.	Btu/bbl	5,825,000	5,825,000	1,13
41920	Distillate used for diesel fuel	Btu/bbl	5,825,000	5,825,000	1,13
41980	Distillate for unspecified use	Btu/bbl	5,825,000	5,825,000	1,13
41990	Distillate fuel oils, n.s.k.	Btu/bbl	5,825,000	5,825,000	1,13
42000	Residual fuel oils	Btu/bbl	6,287,000	6,287,000	1,13
48000	Fuel oil, n.s.k.	Btu/bbl	5,944,767	5,958,289	3D
51100	Crude light oil (from coal)	Btu/gal	130,000	130,000	10
51200	Intermediate light oil (from coal)	Btu/gal	165,000	165,000	5
51700	Other unrefined aromatics, n.e.c.	Btu/gal	139,000	139,000	5
53100	Benzene	Btu/gal	132,519	132,519	8
53200	Toluene	Btu/gal	132,522	132,522	8
53300	Xylene	Btu/gal	134,516	134,516	8



TABLE B-1.- BTU CONVERSION FACTORS (CONTINUED)

Product Code	Energy Product	Conversion Factor			
		Units	1973	1974	Source Code
53400	Naphthalene	Btu/lb	19,852	19,852	9
53500	Sodium phenolate or carbolate	Btu/gal	164,960	164,960	12
53900	Other refined aromatics, n.e.c.	Btu/gal	162,263	162,314	3Q
61000	Lubricating oils, greases, and related products	Btu/bol	6,065,000	6,065,000	1,13
61100	Lubricants	Btu/bol	6,065,000	6,065,000	1,13
61110	Lubricating oils	Btu/bol	6,065,000	6,065,000	1,13
61120	Greases	Btu/bol	6,065,000	5,065,000	1,13
61190	Lubricants, n.s.k.	Btu/bol	6,065,000	6,065,000	1,13
61200	Insulating oil	Btu/bol	6,065,000	6,065,000	2
61300	Hydraulic fluid	Btu/bol	6,065,000	6,065,000	2
61400	Spray oil	Btu/bol	6,065,000	6,065,000	2
61900	Other lubricants, greases, and allied products, n.e.c.	Btu/bbl	6,065,000	6,065,000	2
62000	Medicinal oil	Btu/bbl	6,065,000	6,065,000	2
63000	Petrolatum	Btu/bbl	6,065,000	6,065,000	2
64000	Waxes	Btu/bbl	5,537,000	5,537,000	1,13
65110	Asphalt	Btu/bbl	6,636,000	6,630,000	1,13
65120	Road tar	Btu/gal	160,000	160,000	7
65200	Road oil	Btu/bol	6,636,000	6,636,000	1,13
67000	Unfinished oils	Btu/bol	5,800,000	5,800,000	4
68000	Petroleum products, n.s.k.. used for jet fuel	Btu/bol	5,503,639	5,596,531	3A
69000	Other finished petroleum products, n.e.c.	Btu/bol	6,590,419	6,590,035	3H
71000	Coke and breeze	Btu/s.ton	24,455,393	24,429,220	3K
71110	Coal coke	Btu/s.ton	24,800,000	24,800,000	7
71120	Petroleum coke	Btu/bol	6,024,000	6,024,000	7
71200	Breeze	Btu/s.ton	20,000,000	20,000,000	10
71900	Coke and breeze, n.s.k.	Btu/s.ton	24,455,393	24,429,220	3K
72000	Coal tar	Btu/gal	150,000	150,000	10
73000	Pitch	Btu/s.ton	27,518,428	27,518,428	7
76000	Ammonia products	Btu/s.ton	2,610,930	2,610,930	5
77000	Fuel briquettes	Btu/s.ton	23,500,000	23,500,000	3L
81000	Milled uranium	Btu/s.ton	399,750,000,000	399,750,000,000	11
85000	Fabricated nuclear energy products	Btu/lb	1,040,036,300	1,040,036,300	11
91000	Electricity	Btu/kWh	3412.193	3412.193	7
	Total natural gas liquids—average	Btu/bbl	4,036,739	4,001,536	3F
	Total petroleum products—average	Btu/bbl	5,517,000	5,506,100	1,13
	Total other gas — average	Btu/cu.ft.	967	967	3N



SOURCES

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- 1 Bureau of Mines, Mineral Industry Surveys, Annual Petroleum Statements, Supplements, (appropriate years).
- 2 Assumed to be identical to the value given for lubricants, based on discussion with BOM personnel.
- 3 Derived by averaging Btu factors, weighted by quantities produced in each year, of products nested within.
  - 3A Weighted average of kerosinic and naphthenic jet fuel factors.
  - 3B Weighted average of normal butane and isobutane factors.
  - 3C Weighted average of butane and propane factors.
  - 3D Weighted average of distillate fuel oil and residual fuel oil factors.
  - 3E Weighted average of natural gasoline, isopentane, and plant condensate factors.
  - 3F Weighted average of motor gasoline, kerosine, liquefied gas, ethane, distillate oil, natural gas liquids, n.e.c., jet fuel, and special naphtha (produced from natural gas only) factors.
  - 3G Weighted average of dry natural gas and total natural gas liquids factors.
  - 3H Weighted average of medicinal oil, petrolatum, spray oil, asphalt, road oil, and wax factors.
  - 3I Weighted average of bituminous coal and lignite factors.
  - 3J Weighted average of two different bituminous coal factors:
    - used for metallurgy and exports
    - other uses.



3K Weighted average of coke and breeze factors.

3L Weighted average of bituminous, lignite and anthracite factors.

3M Weighted average of total natural gas, total other gas and coke-oven gas (only production not used as input to total other gas) factors.

3N Weighted average of manufactured gas and mixed gas factors.

3P Weighted average of natural gas, manufactured gas and liquefied gases (only quantities used as inputs to mixed gas production) factors.

3Q Weighted average of sodium phenolate (carbolate), naphthalene, road tar, and pitch of tar factors.

4 Assumed to be identical to the values given for crude oil. No other information is available.

5 Values given are based on telephone conversations with authorities at U.S. Steel Corporation. No other information is available on these products.

6 Nelson, W.L., Petroleum Refinery Engineering, Chemical Engineering Series, New York, McGraw-Hill, 1958 (4th edition), pages 184 and 185.

7 National Coal Association, Bituminous Coal Facts and Figures, table entitled: "Conversion Factors for Fuel and Power," (appropriate years). (Note: These data were originally compiled by Bureau of Mines.)

8 Bland, William F. and Robert L. Davidson, Petroleum Processing Handbook, New York, McGraw-Hill, 1967, page 12 through 15. (Note: Plant condensate is assumed to have the same heat content as isopentane.)

9 Values given are based on telephone conversations with authorities at the American Petroleum Institute.



10 Bureau of Mines, Minerals Yearbook, chapter on "Coke and Coal Chemicals," table 34, 1970 (used for all years).

11 Values given are based on telephone conversations with experts at the U.S. Department of Energy, Nuclear Data Division.

12 Value derived as the average of naphthalene and road tar factors. No other information is available.

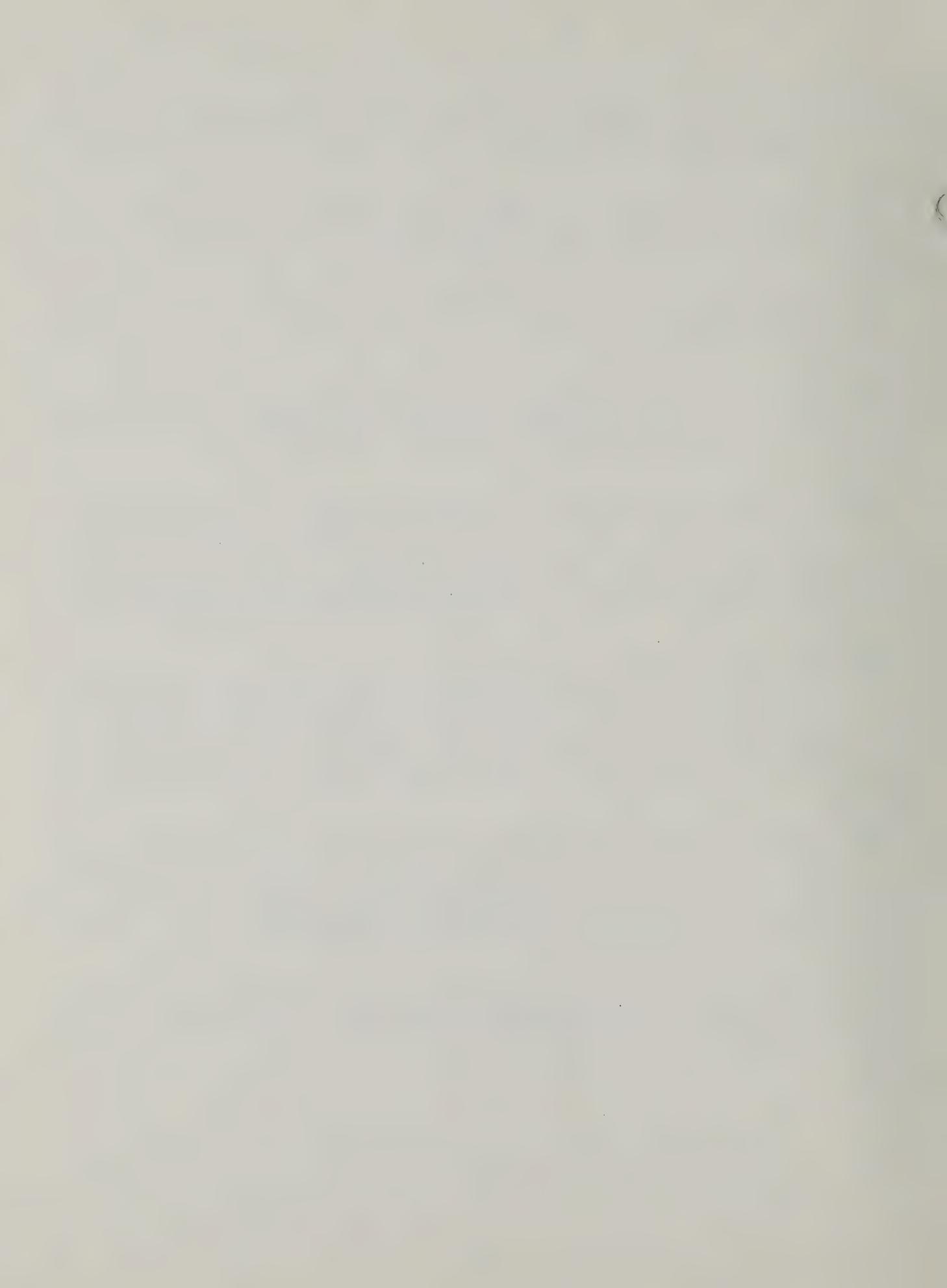
13 Bureau of Mines, Department of Interior News Release on Total Energy Production and Consumption, March 13, 1974 (used for all years).

14 Derived by examination of physical quantity and heat content of bituminous coal used in electric generation. Both types of data were obtained from the National Coal Association publication, Steam Electric Plant Factors, table 2. (Note: These data come originally from FPC Forms 1 and 1-M).

15 Derived by obtaining a weighted average of conversion factors of the principal output components of coal carbonization, including coke, light oils, coke-oven gas, and tars. The basic data needed to derive this method was obtained from BOM Minerals Yearbook, the chapter entitled, "Coke and Coal Chemicals."

16 Derived by examination of physical quantity and heat content of lignite coal used in electric generation. Both types of data were obtained from the National Coal Association publication, Steam Electric Plant Factors, table 2. (Note: These data come originally from FPC Forms 1 and 1-M.)

17 Edison Electric Institute, Statistical Year Book of the Electric Utility Industry for 1975, Edison Electric Institute, New York.



## APPENDIX C

### ENERGY FLOWS THROUGH ENERGY SECTORS

Construction of a DET using data from the NEA can be thought of as occurring in two stages. The first step is straightforward and involves aggregating energy products and industries which consume energy into proper groupings based on BEA definitions. A more difficult second step involves accounting for the flows of energy within energy sectors with special attention to problems of secondary products.

This Appendix presents the energy flows to energy sectors showing the NEA commodities which comprise DET commodity aggregates, NEA industries which comprise DET aggregate energy industries. It also includes descriptive comments when a figure appearing in a DET flow of energy to an energy sector has not been calculated in a straightforward way using NEA data.



## APPENDIX C

Table 1. Energy Flows Through Energy Sectors\*  
 $10^{12}$  BTU

	7	8	31.01	68.01	68.02
Coal	58.538		3.737	10243.00	0.0
Crude	0	1760.203	31653.436		16933.428
Refined	70.399	186.896	2104.954	4028.000	7.513
Electric	35.262	65.614	106,563	664.770	24,496
Gas	1.842	157.230	933.082	3284.00	1195.0
	68.02				

\* Before residual allocation.

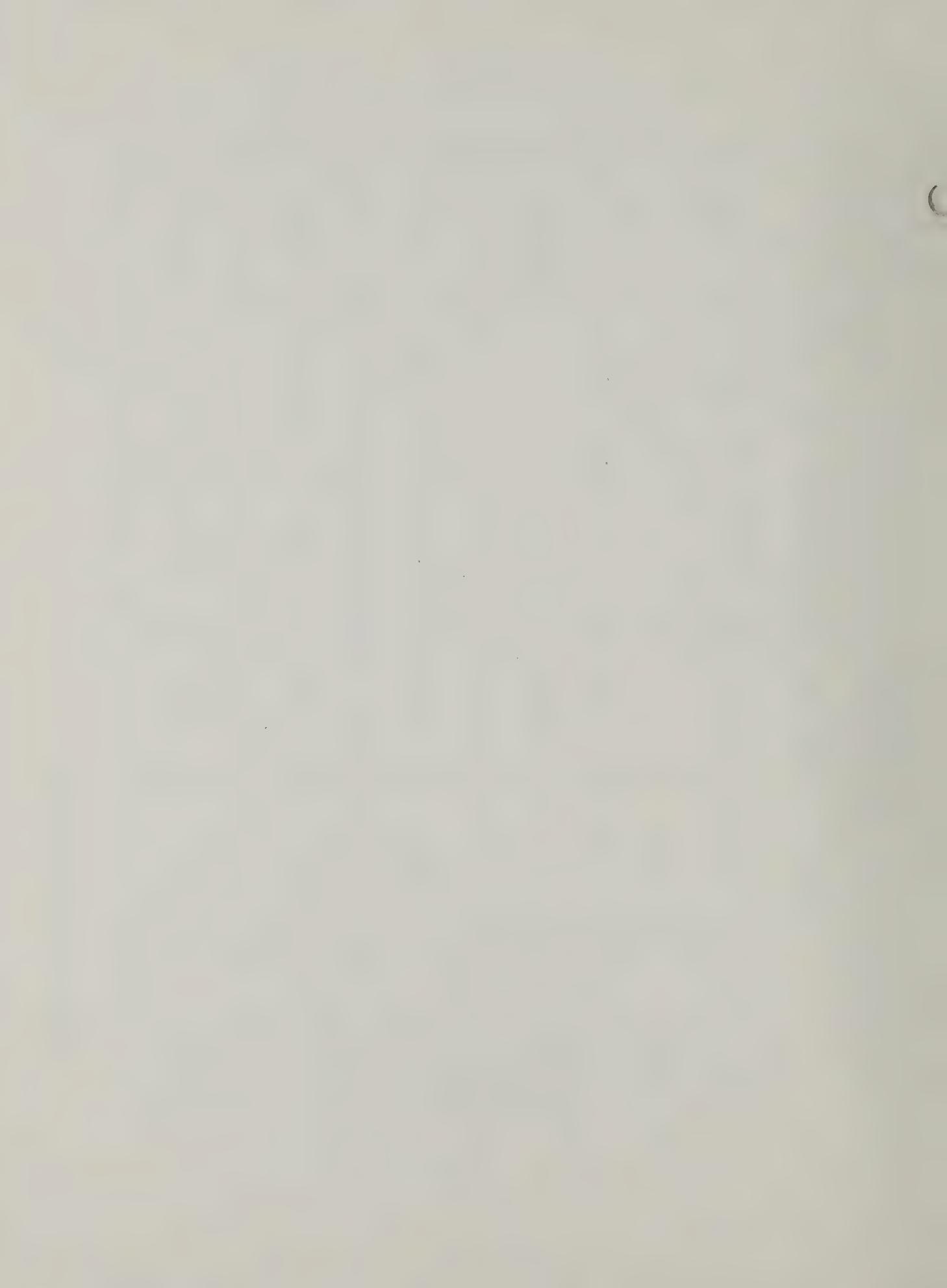


Table 2. Sales of Coal to Energy Sectors.

ERG ENERGY COMMODITY 1	COMPONENT COMMODITY NAMES (from Matrix 1, NEA)	ERG PURCHASING SECTOR	BEA SECTOR NUMBERS	TOTAL ENERGY PURCHASED	COMMENTS
Coal: BEA Sector 7	Anthracite	7	07000 07010 07020	58.538	Includes losses in producing coke. See Note #1.
	Bituminous				
	Lignite				
	Coal NSK				
	Coke and Breeze NSK				
		8	08001 08002 08003	0.0	
		31.01	31011 31012	3.737	Source: Reference [4], Table 21.
		68.01	68900- 689xx	10243.0	Source: Reference [6], pg. 25.
		68.02	68020 68021 68022	0.0	

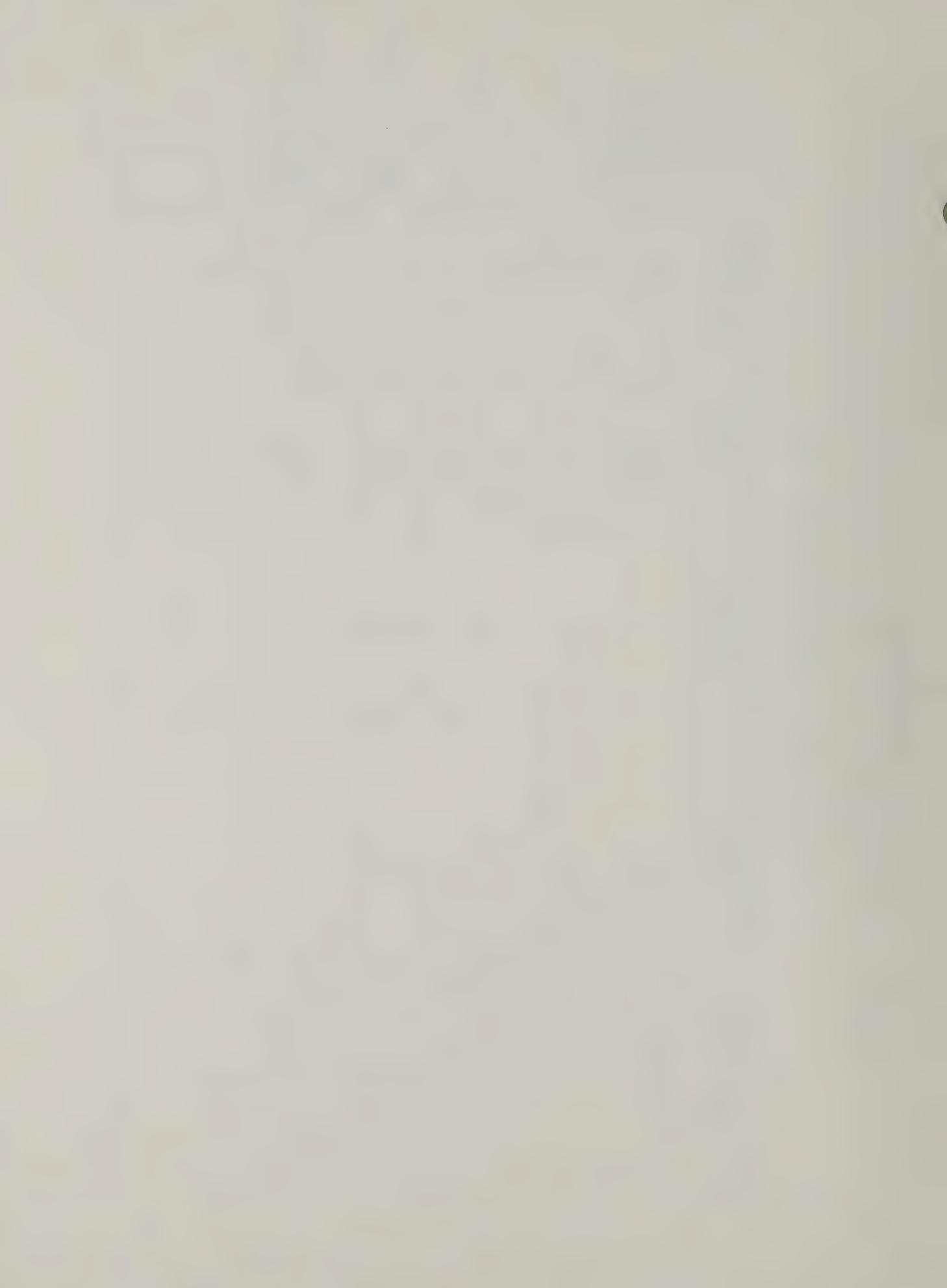


Table 3. Sales of Crude Oil and Natural Gas to Energy Sectors.

ERG ENERGY COMMODITY 2	COMPONENT COMMODITY NAMES (from NEA Matrix 1)	BEA PURCHASING SECTOR	NEA SECTOR NUMBERS	TOTAL ENERGY PURCHASED 10 <sup>12</sup> BTU	COMMENTS
Crude Oil and Natural Gas: BEA Sector 8	Crude Oil Wet Natural Gas Isopentane Natural Gasoline Plant Condensate	7 - - - - - - - - - - 8 - - - - -	07000 07010 07020 08001 08002 08003 - - - - - 31.01 - - - - -	0.0 - - - - - 1760.203 - - - - - - - - - - 31653.436 - - - - -	See Note 3. Also, account must be taken of gas sold to sector 8 from sector 68.02. See Note #2.
			31021 - - - - -	- - - - -	Source: Reference [4] Table 16.
			68.01 - - - - -	68900- 689xx - - - - -	- - - - -
			68.02 - - - - -	68020 68021 68022 - - - - -	Includes the total sales of Dry Natural Gas and Gases NSK plus losses less 6.96% of total which is sold directly by sector 8. (SEE DEP).



## APPENDIX C

Table 4. Sales of Refined Petroleum Products to Energy Sector

ERG ENERGY COMMODITY 3	COMPONENT COMMODITY NAMES (from NEA Matrix 1)	BEA PURCHASING SECTOR	NEA SECTOR NUMBERS	TOTAL ENERGY PURCHASED 10 <sup>12</sup> BTU	COMMENTS
Refined Petroleum: BEA Sector 31.4	Total NEA Petroleum Refining, Liquefied Gases NSK Propane St111 Gas	7 - - - - - - - - - - 8	07000 07010 07020 08001 08002 08003 - - - - - 31.01 - - - - -	70.399 - - - - - - - - - - 186.896 - - - - - 2104.954 - - - - -	Source: Reference [6] Pg. 25.
			68.01 - - - - -	4028.000 - - - - -	
			68.02 68.021 68.022	68020 68021 68022	7.513

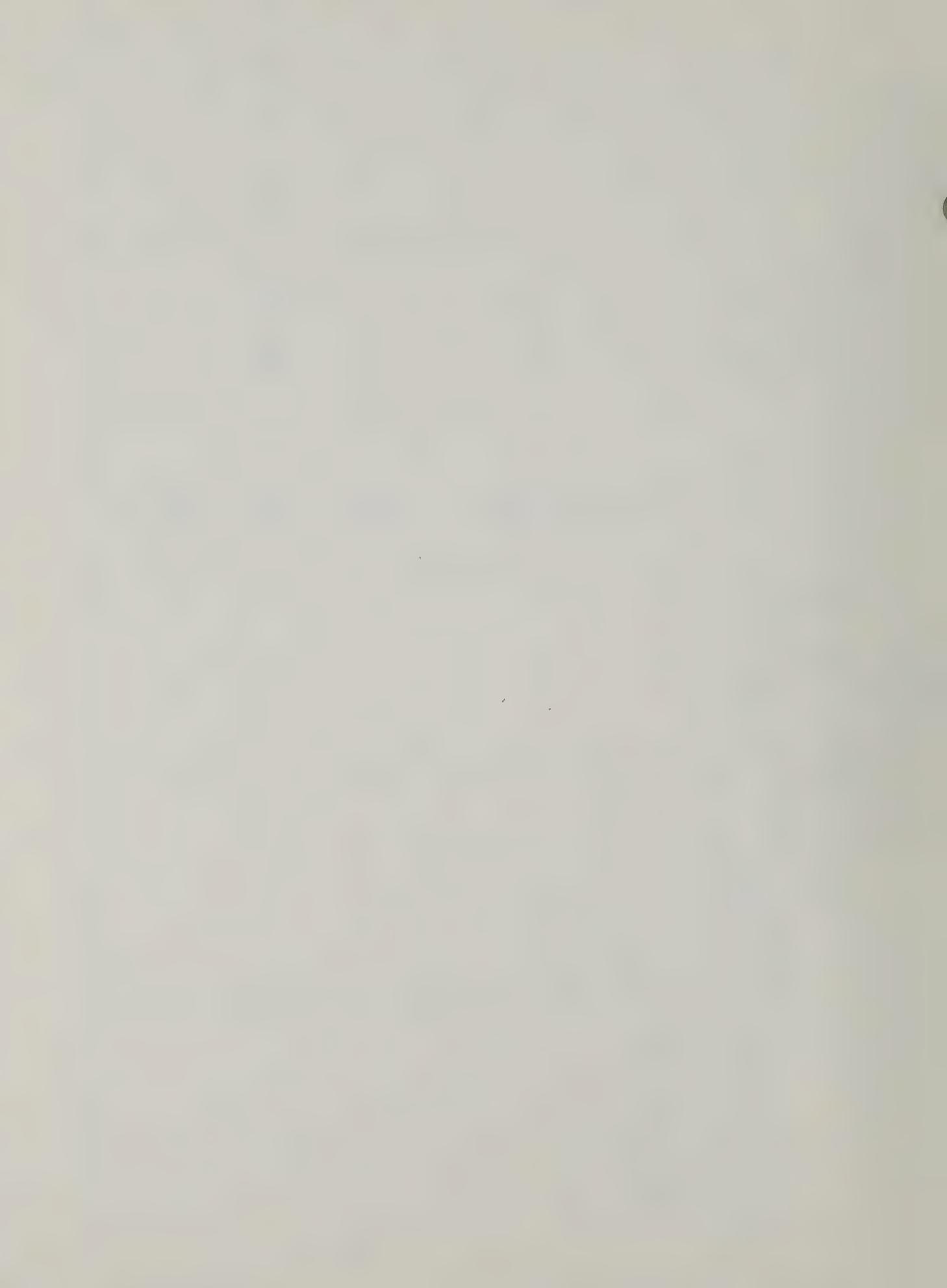


Table 5. Sales of Electricity to Energy Sectors.

ERG ENERGY COMMODITY 4	COMPONENT COMMODITY NAMES (from NEA Matrix 1)	BEA PURCHASING SECTOR	NEA SECTOR NUMBERS	TOTAL ENERGY PURCHASED 10 <sup>12</sup> BTU	COMMENTS
Electricity: BEA Sector 68.01	Electric Utilities Total	7	07000 07010 07020	35.262	
		8	08001 08002 08003	65.614	
			31011 31021	106.563	Source: Reference [4] Table 21.
			68.01	664.770	See Note 3.
			6890- 689xx		
			68.02	68020 68021 68022	24.496



## APPENDIX C

Table 6. Sales of Gas to Energy Sectors.

ERG ENERGY COMMODITY 5	COMPONENT COMMODITY NAMES (from NEA Matrix 1)	BEA PURCHASING SECTOR	NEA SECTOR NUMBERS	TOTAL ENERGY PURCHASED 10 <sup>12</sup> BTU	COMMENTS
Gas Utilities BEA Sector 68.02	Natural Gas (Dry) Gases NSK Coke Oven Gass Manufactured Gases NSK Mixed Gas	7 - 8 - - - - -	07000 07010 07020 - - - - - 08001 08002 08003 - - - - - - - - - - 31011 31021 - - - - - - - - - - - - - - - 68.01 - - - - - - - - - - 68.02 - - - - -	1.842 - - - - - - - - - - - - - - - 157.230 - - - - - - - - - - - - - - - 933.082 3284.000 - - - - - - - - - - - - - - - 68020 68021 68022 - - - - -	See Note 2. Source: Reference [4] Table 21 Source: Reference [6] pg. 25. See Note 3.



## NOTES

### NOTE 1:

According to accounting conventions at the Energy Research Group, coke is considered as coal and sales of coke are included in the sale of coal in the DET. Coke itself is treated as if it were produced by the coal industry and the coal utilized in producing the coke which is actually sold is assigned to the coals use of coal entry in the DET. See Reference [9] and [10] for further details.

In addition, the sale of coal to sector 37 (ERG sector 41) must be corrected. This sale will consist of the total coal sold to sector 37 as shown in the NEA plus the coke sold between establishments within sector 37 minus the coal equivalent of the coke sold outside sector 37 minus the coal equivalent sold within sector 37. This total sale is  $1819.261 \times 10^{12}$  BTU.

### NOTE 2:

According to the 1972 DET  $153 \times 10^{12}$  BTU of product 68.02 is sold from sector 61.02 to sector 8. No data in the 1974 NEA show the sale, probably due to the NEA accounting techniques. Since data are unavailable to determine what this sale actually is, the percentage of gas (68.02) purchased by sector 8 in 1972 will be used to approximate the sale in 1977.

$$\text{Total Sale, 1972} = 153.00 \times 10^{12} \text{ BTU}$$

$$1972 \text{ Total Self Use by sector 8} = 1865.36 \times 10^{12} \text{ BTU}$$

$$\text{Sale fraction} = \frac{153}{1865.36} = .0820$$

Hence, the sale shown in 1977 from sector 68.02 to sector 8 is

$$.0820 \times 1917.433 = 157.230 \text{ BTU.}$$



NOTE 3: Self Use of Fuels.

Due to major discrepancies in self use of fuels for the Crude Oil and Natural Gas, Electric, and Gas Utilities industries, the data for self use in these sectors does not represent NEA data, but instead are based upon independent source data such as the DOE/EIA Energy Data Reports, the A.G.A. Gas Facts, and the E.E.I. Statistical Year Book. It is felt that use of such data are consistent with the NEA since much data in the accounts are based on data from these sources.

A. Crudes self use of crude

Source: Reference [3], Table 2 and Table 6.

Gases Vented and Flared  $136807 10^6$  cu. ft.

Lease and Plant Fuel  $1659145 10^6$  cu. ft.

Based on 1974 Minerals Yearbook data 38.12% of lease and plant fuel is comprised of Dry Natural Gas. This portion of lease and plant fuel should be transfromed into BTU's using the conversion factor for dry natural gas. Hence, the BTU's of self use by sector 8 are seen as:

$$10^6 \times [1093(136807) + 1093(1026613) + 1021(632532)] = \\ 1917.4332 10^{12} \text{ BTU.}$$

B. Electricity self use of Electricity:

Source: Edison Electric Institute "Statistical Yearbook of the Electric Utility Industry." "Total United States Kilowatt-Hour Source and Disposition."

Energy Used by Producer	$2462 10^6$ kWh
Company Use and Free Service	$7037 10^6$ kWh
Lost and Unaccounted for	<u><math>185323 10^6</math> kWh</u>
TOTAL	$184978 10^6$ kWh

BTU conversion factor: 3412.193 BTU/kWh

Total self use of Electricity by Electricity  $664.7702646 10^{12}$  BTU



C. The self use of Gas by sector 68.02:

Source: "Gas Facts, 1975," Table 12, Gas Utility Industry,  
Gas Supply and Disposition.

Company Use as fuel:	910.8	$10^{12}$	BTU
Unaccounted for:	<u>284.2</u>	$10^{12}$	BTU
TOTAL	1195.0	$10^{12}$	BTU

D. Refined's Use of Refined:

Source: Table 21, Reference [4].





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